

Developing an Assessment Protocol to Detect Cognitive Impairment and Dementia in Cree
Aboriginal Seniors and to Investigate Cultural Differences in Cognitive Aging

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Abstract

Recent publications have urged researchers to address neuropsychological assessment issues among culturally and linguistically diverse individuals for whom current assessment measures are not typically appropriate. This dissertation examined cultural considerations in clinical neuropsychological practice with Cree-speaking Canadians residing in Saskatchewan. Four inter-related studies focused on understanding cultural perceptions of normal aging and dementia within a Canadian Aboriginal population, modifying existing screening and neuropsychological assessment instruments for use in both normal aging research and clinical practice, and investigating the role of culture in cognitive aging with Cree-speaking. Study 1 involved the qualitative analyses of a series of key informant interviews with an Aboriginal Grandmothers Group. Three related themes were identified that highlighted Aboriginal experiences of aging, caregiving, and dementia within the healthcare system. The third theme, the importance of culturally grounded healthcare, directly informed test development for Studies 2 and 3. In Study 2, two screening measures that were adapted for use with seniors from diverse cultural groups were further modified and examined for use with Canadian Aboriginal seniors. Overall, performance was consistent across the two screening measures, and the measures informed clinical diagnosis and were well-received by both the Aboriginal patients and their family members. Study 3 describes the development of the Grasshoppers and Geese Test battery (G&G), created by modifying and integrating existing instruments and paradigms for language and memory assessment for use with culturally diverse seniors. All G&G subtests demonstrated adequate preliminary psychometric properties and generated excellent sensitivity and good specificity in differentiating healthy older adults from adults with Alzheimer's disease. Finally, Study 4 examined performance on the G&G and on other neuropsychological measures in

groups of young-middle aged and older adults from majority culture and Cree background. Cree participants' mean scores were lower on measures of confrontational naming, semantic memory, verbal fluency, prospective memory, and processing speed, and were presumed to be in keeping with the significantly fewer years of education, lower estimated reading ability, and possible health disparities in the participants of Cree background. Findings of the four studies are discussed in the context of implications for current clinical practice and with regard to future research.

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General Introduction

This program of research involves the development of an assessment protocol to detect cognitive impairment and dementia in individuals of culturally diverse backgrounds, including Aboriginal seniors, and the complementary investigation of cultural differences in cognitive aging. This series of four studies was conducted to address the current lack of neuropsychological assessment methods and approaches for cultural minorities. The primary objectives of the proposed research were both theoretical and clinical in nature. From a clinical perspective, the primary goal of the proposed research was to develop a culturally appropriate assessment protocol for the identification of cognitive impairment and dementia among older Aboriginal adults. From a theoretical perspective, the proposed research also aimed to contribute to an understanding of cultural differences in cognitive aging. The following general overview provides a summary of the relevant research and cultural considerations in neuropsychological assessment and in the detection of dementia, followed by four manuscripts. Literature is reviewed on dementia, dementia and Aboriginal populations, definitions of culture and description of Canadian Aboriginal populations, and review of extant literature exploring cultural perceptions of dementia. Study 1 describes the qualitative analyses of a series of focus groups with an Aboriginal Grandmothers Group that formed the basis of the test development work described in Studies 2 and 3. Study 1 also provides information on conceptions of aging and dementia in a group of Canadian Aboriginal seniors. Literature on culture and neuropsychological assessment, neuropsychological assessment with Aboriginal populations, and culturally appropriate neuropsychological screening and assessment is reviewed as the background for Study 2 and 3. In Study 2, two screening measures that were adapted for use with seniors from diverse cultural groups were further modified and examined for use with Canadian

Aboriginal seniors. Study 3 describes the development of the G&G created by modifying and integrating existing instruments and paradigms for language and memory assessment for use with culturally diverse seniors. Finally, research on the influence of culture on cognitive aging is described as the context for Study 4. Study 4 examines performance on the G&G and on other neuropsychological measures in groups of young-middle aged and older adults from majority culture and Cree background.

Research Context

My research was conducted under the auspices of a Canadian Institutes of Health Research New Emerging Team (NET) on cognitive aging (2008; Morgan et al., 2009; Morgan et al., 2010). The NET was funded for over six years (2003-2009) to carry out research projects aimed at improving availability, acceptability, and accessibility of specialized dementia services for individuals residing in rural and remote communities. The establishment of an interdisciplinary “one-stop” Rural and Remote Memory Clinic and telehealth facilitated pre-clinic assessment and follow-up services, and associated evaluation research, were the “flagship” initiatives of the team designed to address these goals. One component of these initiatives, the development and evaluation of a culturally appropriate protocol for assessing cognitive impairment and dementia in Aboriginal seniors, was the primary clinical objective of the research described in this dissertation.

Dementia

Dementia, a term representing a wide range of cognitive impairments of numerous etiologies, is the most common major disorder in older adults (Gurland et al., 1997). The Diagnostic and Statistical Manual of Mental Disorders (DSM; American Psychiatric Association, 2000) describes the key diagnostic feature as “the development of multiple cognitive deficits”

(p.148), including impairment in memory and at least one other cognitive domain (e.g., language, motor skills, visuospatial perception, and executive functioning, etc.). The most common form of dementia is Alzheimer's disease (AD), which is characterized by a global and progressive decline in cognitive functions, the initial stages of which are commonly associated with episodic memory impairment and deficits in activities of daily living (American Psychiatric Association, 2000; McKhann et al., 1984; Salmon & Bondi, 2009).

Data from the Canadian Study of Health and Aging (Canadian Study of Health and Aging, 1994) indicated an incidence of over 60,000 new cases of dementia each year in Canada, and an estimated prevalence of dementia for Canadians 65 years and older of approximately 8%. More recent statistics from the Alzheimer Society of Canada Rising Tide report (Alzheimer Society of Canada, 2010) indicate an incidence of 257,811 new cases per year by 2038 (representing a 2.8% increase from 2008) in individuals over 65 years of age, and a prevalence of almost 9% in individuals over the age of 60 in Canada by 2038. The population is aging at a global level, and the number of people age 65 and older is expected to increase from 500 million worldwide to 1 billion by 2030 (National Institute on Aging, 2007). This is even more pronounced in rural areas, where, due to both an aging demographic and migration, 33% of seniors reside in rural regions, and remote rural areas have a higher number of seniors than in cities or less remote rural regions (Dandy & Bollman, 2008). Additionally, there are increasing numbers of ethnic and cultural minority older adults (Cammer, 2006; Manly, Byrd, Touradji, & Stern, 2004; Rivera Mindt, Byrd, Saez, & Manly, 2010). Both older adults of diverse cultural backgrounds and those from rural areas are vulnerable populations who typically do not have access to adequate health care services, including specialized dementia assessment and care services (Cammer, 2006; Congdon & Rosswurm, 2001; Jervis & Manson, 2002).

Aboriginal Populations and Dementia

Despite a growing body of literature on aging and dementia with minority cultures, there is a relative absence of such research with Aboriginal populations (Jervis & Manson, 2002), particularly in Canada. Extant research has focused predominantly on comparing rates of Alzheimer's disease (AD) among African American and Hispanic populations in the United States to rates among European Americans; however, findings from these studies are inconsistent. Some studies have reported higher rates of cognitive impairment, dementia, and AD among ethnic minorities when compared to European Americans (Demirovic et al., 2003; Hendrie, 1999; Prineas et al., 1995), and that the rate of dementia on admission to nursing homes is higher among African American residents than among European American residents (Weintraub et al., 2000). In contrast, however, the Duke Established Populations for Epidemiological Studies for the Elderly (EPESE) project found no differences in prevalence of dementia between African Americans and European Americans (Fillenbaum et al., 1998). The aforementioned studies employed the National Institute of Neurological and Communicative Disorders and the Stroke-Alzheimer's Disease and Related Disorders (NINCDS-ADRDA; McKhann et al., 1984) criteria, comprehensive neuropsychological assessment, and neurological data, and corrected for years of education.

Previous research with Native American and other Aboriginal groups have cited a lower rate of AD than European Americans, but equivalent rates of overall cognitive impairment or dementia (Hendrie et al., 1993; Hendrie et al., 2006; Rosenberg et al., 1996; Weiner et al., 2003). In a sample of 192 Cree older adults living on two reserves in Manitoba, and an age-stratified sample of 241 English-speaking European Canadians living in Winnipeg, Hendrie et al. (1993) found that, using the Community Screening Interview for Dementia (CSI 'D'), there was

a significant difference between the age-adjusted prevalence of AD among Cree individuals (0.5%) as compared to the European Canadians (3.5%), despite the two groups having an equivalent age-adjusted prevalence of dementia (4.2%). Rosenberg et al. (1996) investigated dementia in a group of Cherokee Indians living in northeastern Oklahoma. The NINCDS-ADRDA criteria were used to identify 23 individuals with AD and an equal number of controls who were compared to the clinical group. Rosenberg et al. (1996) found that as the genetic degree of Cherokee ancestry increased, the frequency of AD decreased. In fact, older adults with more than 50% genetic Cherokee ancestry were less likely to be in the AD group than the control group, independent of apoE4 allele status, a known risk factor for AD in majority culture populations. In research examining patterns of presentation and course of AD, Weiner et al. (2003) reported a similar course of illness between Native Americans and European Americans, with the exception of a greater prevalence of cardiovascular risk factors in Native Americans. Further, in a survey of all autopsies on individuals ages 40-70 in the Maryland Chief Medical Examiner's office for an 8-year time period, researchers assessed the prevalence of senile plaques (SPs) and neurofibrillary tangles (NFTs) in three brain areas: the hippocampus, entorhinal cortex, and inferior temporal cortex (Sandberg, Stewart, Smialek, & Troncoso, 2001). The authors concluded that the prevalence of mixed SPs and NFTs was strongly correlated with age, but there was no evidence that these pathological changes differed in frequency by race.

Recent research has identified that dementia appears to be increasing in Aboriginal populations in British Columbia, Canada (as described in Hulko et al., 2010). The authors attribute the increase in dementia to increasing life expectancy and the prevalence of risk factors such as diabetes, cardiovascular disease, and low socioeconomic status in the Canadian Aboriginal population (e.g., Gracey & King, 2009; Smylie & Anderson, 2006)

Definition of Culture

In the research literature there is general agreement that cognition is culturally embedded but how culture is defined varies. This program of research adopts Ardila's (2005) conceptualization of culture as a set of "learned traditions and living styles shared by the members of a society" (p. 185) and further distinguishes the internal representation of culture (i.e., thinking, knowledge, and attitudes), the behavioural dimension, which refers to behaviour in different contexts and ways of relating to others, and the cultural dimension, which describes the physical elements that represent membership to a particular group (i.e., clothes, ornaments, etc.). Ardila (2005) further states that, although basic cognitive processes are universal, culture influences how particular cognitive process are applied, and what is situationally relevant or valued. Similarly, Luborsky and McMullen (1999) define culture as "shared basic value orientations, norms, and beliefs, as well as customary habits and way of living" (Luborsky & McMullen, 1999, p. 65). Horton, Carrington, and Lewis-Jack (2001) emphasize that human cognitive functioning, as a reflection of brain-behaviour interactions, cannot be separated from the cultural and immediate social context in which the behaviour develops.

Race, ethnicity, and culture are interrelated and sometimes politically "loaded" concepts (Teng & Manly, 2005, p. 92). Defining groups simply by these terms disregards within-group heterogeneity and minimizes group differences on factors such as education, vocabulary, reading level, and acculturation that directly affect test performance (Teng & Manly, 2005). Additionally, racial and ethnic classification in health research maintains potential for stigma and reinforce race as a scientific concept (Manly, 2006b). Nevertheless, Manly describes that the value of the construct of race is that it serves as a relatively accessible proxy for more meaningful but complex variables, such as quality of education, reading level, health,

socioeconomic status, and acculturation. Manly points out the importance of deconstructing race and ethnicity based on these factors and she emphasizes that understanding “the effects of cultural experience on behavior, attitudes, and other health outcomes reduces the importance of racial classifications and highlights the distinctiveness and depth of culture” (Manly, 2006b, p. S10).

Canadian Aboriginal Populations

The Aboriginal population in North America is highly heterogeneous and the diversity of Canadian Aboriginal populations who reside in the Prairie provinces cannot be over-emphasized; just as there is no single language, there is no single cultural tradition (Kramer, 1996). The heterogeneity is further enhanced by the bifurcation into rural or remote vs. urban dwelling populations. More than 300 identifiable tribal groups make up the First Nations population of North America and there is considerable heterogeneity among the tribal groups. My program of research focuses on one Aboriginal group, individuals of Cree background. The Cree are the largest group of First Nations in Canada with over 135 registered bands. There are five major dialects, including Northern/Woodlands Cree and Michif Cree (Grant, 2000). Our participants self-identified mainly as individuals of Northern Cree, Métis (of Northern Cree descent), and Woodlands Cree background.

Cultural Perceptions of Dementia

Given that culture is an important aspect of the experience of any disease, understanding possible differences in perceptions of dementia and caregiving practices is essential to providing adequate, culturally competent healthcare services. Current research supports the necessity for exploring unique cultural explanations of aging and dementia among different cultural groups and incorporating cultural values into assessment and treatment protocols (Daker-White, Beattie,

Gilliard, & Means, 2002; Espino, Lichtenstein, Palmer, & Hazuda, 2001; Kane, 2000). Several studies have shown unique sociocultural explanations of both dementia and dementia caregiving. For example, in a qualitative analysis of Chinese-American family caregivers, Hinton, Guo, Hillygus, and Levkoff (2000) reported that dementia-related changes were construed as normal aging processes. Several other studies with ethnic minority groups in the United States describe views of dementia-related changes as typical of the normal aging process (Braun, Takamura, Forman, Sasaki, & Meininger, 1995; Elliot, Di Minno, Lam, & Tu, 1996). In a study with African-American, Chinese-American, Irish-American, and Puerto Rican- and Dominican-American family caregivers in the United States, three different story types emerged: 1) Alzheimer's Disease as a disease that erodes the core identity of a loved one; 2) aspects of dementia (e.g., confusion and disability) as expected aspects of growing old; and, 3) dementing illness as reflective of tragic loss, loneliness, and family fragmentation due to resettlement, tragedy, or loss of filial responsibility (Hinton & Levkoff, 1999). There is also evidence that there are conceptions of dementia that include both traditional biomedical models of the disease and cultural contributions to understanding symptoms and the disease process. For example, Chee and Levkoff (2001) found that Korean caregiver participants' perceptions of dementia were informed by aspects of the biomedical model and cultural meanings of behavioural and cognitive changes.

The importance of exploring unique perceptions within different Aboriginal populations is emphasized by John, Hennessy, Dyeson, and Grant (2001) who indicate that in the United States, "the cultural construction of dementia varies within and across American Indian tribes in accordance with individually held health beliefs that are part of larger cultural systems" (p. 39). Henderson and Henderson (2002) described a case of dementia in an American Indian family,

where psychiatric symptoms of dementia were interpreted as “supernormal”, representing communications with the supernatural world. Without understanding the cultural beliefs that influence perceptions and clinical characteristics of dementia among Aboriginal people living in Saskatchewan, it is difficult to conduct appropriate assessments and to provide effective services to individuals. This was the rationale for Study I, which involved a series of focus groups with Aboriginal Grandmothers to explore cultural conceptions of aging and dementia and to identify culturally appropriate assessment approaches with Aboriginal Seniors.

The Impact of Culture on Neuropsychological Assessment

Psychological tests “have been conceived and standardized within the matrix of Western culture” (Nell, 2000, p. 3). Accordingly, the vast majority of neuropsychological measures that are used to assess ethnically diverse older adults have been developed for White urban-dwelling individuals (Wong & Baden, 2001). In an address to the International Neuropsychological Society, Matthews (1992) stated that “a very limited kind of the world’s population, is presented to the rest of the world as if there could be no other kind of neuropsychology, and as if the education and cultural assumptions on which... neuropsychology is based were obviously universals that applied everywhere in the world” (cited in Ardila, 1995, p. 3). The problematic nature of these assumptions in research and assessment is becoming increasingly evident. For example, individuals from different ethnic groups often perform differently on standard intellectual and neuropsychological tests and several studies have indicated that ethnic or cultural factors can have a substantial effect on neuropsychological test performance (Brickman, Cabo, & Manly, 2006; Manly, 2006a; Manly et al., 2004). Even when ethnic groups are matched on socioeconomic variables, discrepancies in neuropsychological test performance appear to remain (Manly et al., 1999). For example, Roberts and Hamsher (1984) found that healthy European

Americans obtained significantly higher scores on a measure of visual naming ability than did African Americans (Roberts & Hamsher, 1984). These differences also have been found for measures of nonverbal abilities. Although cross-cultural differences have not been found in all studies reported in the literature and one study failed to find systematic differences in performance between racial, ethnic, or cultural groups after participants were matched on years of education (Carlson, Brandt, Carson, & Kawas, 1998), aggregate findings suggest that not all neuropsychological tasks have functional equivalence and some are sensitive to effects of education and cultural experience. Accordingly, when conducting neuropsychological evaluations of individuals who are members of cultural and/or linguistic minority groups, psychologists are at risk of committing diagnostic or interpretative errors. This problem results from (a) lack of understanding of how psychological and psychiatric problems develop or present in persons of different cultural and ethnic backgrounds, and (b) lack of appropriate assessment instruments available for persons from diverse backgrounds. Very few tests have been designed for and evaluated on persons who have different cultural and/or language backgrounds (Manly & Echemendia, 2007; Rivera Mindt et al., 2010; Romero et al., 2009). “Improper”, non-representative norms can lead to biased or inaccurate conclusions. If, for example, an ethnic group performs more poorly on certain tests than the majority culture, then use of these tests to classify members of this group into diagnostic categories (e.g., cognitively impaired, learning disabled, etc.) can result in inaccurate decisions that can have detrimental consequences.

Several factors have been proposed to explain differences in performance on neuropsychological tests in members of different cultural and ethnic groups. Many ethnic minority elders have limited experience taking tests, lack general test-taking skills, and may not

highly value the assessment process (Scruggs & Lifson, 1985). Consequently, these factors could explain differences typically found on both verbal and nonverbal tests, including simple sensory-motor tests such as reaction time and manual dexterity. Additionally, ecological validity of the tested cognitive domains might be low and items may not be culturally relevant (Manly, 2006b; Manly & Echemendia, 2007). For example, subsistence farmers may not place high value on abstract thinking or the ability to learn and recall word lists.

Another well-researched factor is related to education differences between majority and non-majority cultures. Differences in quality of education among inner-city schools, rural schools, and suburban schools can be substantial. Thus, matching on years of education will not correct test performance in disadvantaged groups. Several studies show that reading level has the highest correlation with performance on verbal and nonverbal tests, outranking years of education (Manly, Byrd, Touradji, & Stern, 2004; Manly et al., 1999; Manly, Jacobs, Touradji, Small, & Stern, 2002). Additionally, test norms are insufficiently adjusted for education at the low end of the education range. Research has shown that when people with education equal to or less than 8 years of education are combined as a single “low education” group, which is conventional practice, individuals with no or few years of schooling, including a higher percentage of older individuals, females, rural residents, and ethnic minorities, tend to score at the low end of the normative group and are more likely to be considered impaired (Liu et al., 1994; Teng & Manly, 2005).

Other important factors in understanding cultural differences in neuropsychological test performance include racial socialization and acculturation. In an early study on this topic, Katz (1964) found that the degree of racial socialization (e.g., perceived racial discrimination and segregation) has an impact on level of comfort and confidence during neuropsychological

testing. Related to racial socialization is the concept of stereotype threat, which refers to the effect of attention being diverted from a task due to concern that one's performance will confirm a negative stereotype expected for one's group. Several researchers have found that stereotype threat attenuated performance on cognitive tests (McKay, 2003; Steele, 1997; Steele & Aronson, 1995). For example, Steele (1997) and Steele and Aronson (1995) found that African American undergraduates performed more poorly on a test of difficult verbal GRE exam items than SAT score matched Caucasian participants when the test was described as related to intellectual ability, but when the same test was described as a challenging task, there were no score differences.

Acculturation typically has not been addressed as a variable in neuropsychological research. Extant research has usually classified participants based on self-identified racial/ethnic classification rather than measure the cultural variables that are associated with membership in a cultural group. Landrine and Klonoff (1996) describe acculturation as the level to which people participate in the values, language, and practices of their cultural community rather than those of the majority culture. Although this variable has not typically been addressed, several studies have shown an influence of level of acculturation on neuropsychological test performance. Manly et al. (1998) found that African Americans who were less acculturated obtained lower scores on measures of general information and naming. Additionally, Manly et al. (1998) reported that acculturation accounted for a significant amount of variance on measures of both verbal and nonverbal abilities, after controlling for other demographic variables.

In an attempt to reduce the influence of these aforementioned factors on neuropsychological test performance, researchers have discussed two options when using existing measures: (1) separating test norms for different cultural groups; or, (2) setting more

lenient cutoffs for impairment among ethnic minorities (Manly, 2005; Manly & Echemendia, 2007). However, both options have inherent limitations. Separate norms may not adequately address the variability inherent in race, culture, and education that underlies differences in cognitive test performance. Instead, also measuring the predictable variables which underlie test performance across cultural groups may serve to increase accuracy of cognitive assessment and the validity of all instruments used to detect and diagnose dementia. Recommendations proposed by Manly (2006) include asking for self-identification of ethnicity, documenting cultural experiences, and assessing reading level using standardized measures, such as the reading subtest of the Wide Range Achievement Test – 3 (WRAT-3; Wilkinson, 1993). As Nell (2000) cautions, “until language proficiency, quality of education, test-wiseness, cognitive style, and other components of acculturation have been proved beyond any reasonable doubt to be equivalent for the groups whose scores are being compared, score differences cannot be attributed to genetic differences.” (p. xiv).

Culturally Appropriate Neuropsychological Screening Measures

As highlighted, one important limitation of current neuropsychological measures used to assess higher brain functions is that the majority of tests have not been properly validated for use among ethnic minorities in North America (Manly, 2006b). This tends to result in high rates of false positives (i.e., falsely detecting impairment) for ethnic minorities. Performance on neuropsychological screening measures for detecting cognitive impairment and dementia is influenced by language, education, and the ecological relevance of test items (Teng, 1996). For example, the standard cutoff score of 24 out of 30 on the Mini-Mental State Examination (MMSE; Folstein, Folstein, & McHugh, 1975), which is the most readily available screening tool for cognitive impairment, is used by clinicians to make diagnostic decisions and to determine the

need for more comprehensive evaluation of cognitive functioning. This cutoff score on the MMSE often results in over-diagnosis of dementia among African Americans, even after controlling for years of education (Bohnstedt, Fox, & Kohatsu, 1994). A host of studies have found racial, ethnic, and cultural differences in MMSE performance even after adjusting for education (Fillenbaum, Hughes, Heyman, George, & Blazer, 1988; Teresi, Albert, Holmes, & Mayeux, 1999; Welsh et al., 1995). Consequently, there are methodological and conceptual limitations in using existing assessment tools for cross-cultural dementia assessment and research.

There are two main approaches to the development of culturally appropriate assessment tools designed to address some of the conceptual problems of cross-cultural dementia research. One approach involves utilizing what are assumed to be “culture-invariant” assessment tasks such as speeded finger tapping (Herbert, 2001). A second method, termed harmonization, includes modifying existing assessment tools in ways consistent with the culture and language of the study population (World Health Organization, 1990). Several screening instruments have been developed using the harmonization method, and some have demonstrated utility in cross-cultural dementia research.

Glosser et al. (1993) developed the Cross-Cultural Cognitive Examination (CCCE) to screen non-literate populations. Originally constructed for a National Institutes of Health (NIH) neuroepidemiologic study of Guam-Parkinsonism-Dementia-Complex, the CCCE has been demonstrated to be less sensitive to language, education, and social factors and has adequate criterion-related validity relative to other dementia screening measures. Nevertheless, Glosser and colleagues described culture based differences in the overall score, and the items that were culturally biased were also the most sensitive to detecting early stage dementia (e.g., verbal

memory, fluency, and abstraction). Consequently, eliminating these items would result in an unacceptably low level of sensitivity.

Another instrument developed using the harmonization method is the Community Screening Interview for Dementia (CSI ‘D’), developed by Hall and her colleagues (Hall et al., 1993). The CSI ‘D’ is the first screening instrument for detecting cognitive impairment that has been developed specifically for Aboriginal populations. The CSI ‘D’ has been translated into Cree and its utility has been demonstrated for Cree populations. However, the clinical application of this measure remains untested and it has not been used with Aboriginal populations in Saskatchewan.

Another instrument developed using the harmonization approach is the Cognitive Abilities Screening Instrument (CASI; Teng et al., 1994). The CASI was developed for a coordinated epidemiological cross-cultural study of dementia in the U.S. and Asia. Teng and her colleagues started with the most common dementia screening instruments in the U.S. and Japan, and merged and modified the items to improve cross-cultural applicability, reliability and sensitivity. This screening instrument is an adaptation of the MMSE and the Hasegawa Dementia Screening Scale (Hasegawa, 1983) and has been translated into Chinese, Japanese, and Spanish. It has been modified to take into account variations in educational background and other factors that can potentially affect test results in minority cultures. However, this screening instrument has not been used with Aboriginal populations. Study 2 involved further modification of the CSI ‘D’ and CASI and examination of their clinical utility through a series of clinical case studies.

Culturally Appropriate Neuropsychological Assessment Measures

In addition to culturally appropriate screening instruments for detecting dementia, there is a need for other culturally relevant neuropsychological tools for the comprehensive clinical

assessment of higher brain functions (e.g., memory, language, visuospatial skills). These tools are used to aid in differential diagnosis, to inform treatment planning, including medication decisions, and to profile the cognitive strengths and limitations of the patient.

Assessment of semantic memory, a type of long-term memory involving the store of culturally-shared general knowledge about the world (Tulving, 1983), is one aspect of a comprehensive neuropsychological assessment. Investigation of semantic memory is particularly important in advancing our current understanding of frontotemporal dementia (Snowden, 1999). Frontotemporal dementia is a set of clinical syndromes that are characterized by progressive dysfunction of the anterior temporal and frontal lobes. One clinical syndrome identified is semantic dementia. A test of semantic associations (e.g., Pyramids and Palm Trees Test; Howard & Patterson, 1992) is useful in the early detection of semantic dementia. The Pyramids and Palm Trees Test requires a participant to access semantic information by examining a series of conceptually related drawings presented in triads. The target picture (e.g., pyramid) is presented above two other drawings and the participant is asked to decide which of the two drawings (e.g., palm tree or pine tree) has the closest association to the target picture. This test has been developed for urban European populations and is subject to cultural and geographic biases that limit its usefulness in testing the semantic memory of individuals residing in rural and remote regions of North America. Study 3 involved adapting the Pyramids and Palm Trees (PPT) to the Grasshoppers and Geese (G&G) semantic associations task according to the guidelines set by DeVellis (2003).

Cultural Differences in Cognitive Aging

Given the increased cultural heterogeneity among older adults, understanding test performance and aging among diverse seniors is of emergent importance. Age-related declines in

some cognitive processes have been well documented for the majority cultures (e.g., Craik & Salthouse, 2000), but methodological limitations have posed a challenge for investigations of cultural influences on cognitive aging (Glymour & Manly, 2008; Pedraza & Mungas, 2008) and little information is available about cross-cultural analogs to models of age-related decline.

Extant research investigating cultural differences in cognition and the interaction between culture and age on cognitive processes has focused on East Asian and American populations. East Asians are thought to process information in a more holistic, contextual manner; which is contrasted with the Western tradition of personal agency resulting in more feature-based analytic and categorical cognitive processes (Masuda & Nisbett, 2001; Nisbett, Peng, Choi, & Norenzayan, 2001). In a sample comparing Chinese adults and American adults, Hedden et al. (2002) reported no cultural differences on speed of processing and working memory tasks that involved visuospatial processing. However, cultural differences emerged on tasks where numerical stimuli were used; furthermore, cultural differences observed in young adults were attenuated in the older age group. Although it might be hypothesized that age would magnify the effects of culture on cognitive processes, Park et al. (1999) proposed a model in which the degree to which tasks are demanding of cognitive resources (e.g., processing speed and working memory) mediates cultural differences in performance and age-related decline. According to this model, on “culture-invariant” tasks (e.g., speeded finger tapping), young adults of different cultures will perform similarly and age-related decline will occur in both cultures at an equivalent rate. In contrast, if a task is not based on effortful, strategic cognitive processes, cultural differences evident in young adults will show magnified cultural differences with age, due to the sustained impact of the environment and learning (Park & Gutchess, 2002). However, for tasks that are both culturally saturated *and* demanding of cognitive resources, convergence of

performance will occur in late adulthood. That is, although young adults show cultural differences on these tasks, older adults across the two cultures will perform with greater similarity due to an age-associated decline in cognitive flexibility for resource demanding tasks. Park et al. (1999) postulated that, under process-intensive conditions (i.e., when task demands are high), brain-based declines associated with aging may impose constraints on the ability to apply strategies and knowledge structures specified by culture.

There is very little research on cognitive aging in Aboriginal populations, and, in particular, Canadian Aboriginal populations. Limited previous research in educational settings has suggested that Aboriginal populations may employ different cognitive styles than their Western counterparts. In particular, Tafoya (1982) argued that Native Americans' reasoning processes tend to be more global or holistic and less of a linear-sequential-analytical reasoning process. Further, Tafoya (1982) and Tharp (1994) posited that learning styles of Aboriginal populations differ from European Americans. However, this previous research did not employ culturally appropriate assessment techniques and may represent continued inaccurate assumptions regarding cognitive performance in Aboriginal populations. Despite preliminary theorizing about the impact of culture on cognitive function in Aboriginal populations, no research to date has examined the interaction of age and culture on the cognitive functions of Aboriginal groups in comparison to majority culture populations. Indeed, there is a paucity of neuropsychological research and normative data collection, in general, with Aboriginal Canadians, although it is well-known in the neuropsychology literature that Aboriginal individuals have lower scores on most traditional intellectual assessment measures (Suzuki & Valencia, 1997). This lack of research on cognitive aging processes in Aboriginal seniors was the focus of Study 4.

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RUNNING HEAD: Aboriginal Experiences of Aging and Dementia

Study 1: Aboriginal experiences of aging and dementia in a context of sociocultural change:

Qualitative analysis of key informant group interviews with Aboriginal seniors

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Abstract

Examining the role of culture and cultural perceptions of aging and dementia in the recognition, diagnosis, and treatment of age-related cognitive impairment remains an understudied area of clinical neuropsychology. This paper describes a qualitative study based on a series of key informant group interviews with an Aboriginal Grandmothers Group in the province of Saskatchewan. Thematic analysis was employed in an exploration of Aboriginal perceptions of normal aging and dementia and an investigation of issues related to the development of culturally appropriate assessment techniques. Three related themes were identified that highlighted Aboriginal experiences of aging, caregiving, and dementia within the healthcare system: (1) cognitive and behavioural changes were perceived as a normal expectation of the aging process and a circular conception of the lifespan was identified, with aging seen as going “back to the baby stage”, (2) a “big change in culture” was linked by Grandmothers to Aboriginal health, illness (including dementia), and changes in the normal aging process, and (3) the importance of culturally grounded healthcare both related to review of assessment tools, but also within the context of a more general discussion of experiences with the healthcare system. Themes of sociocultural changes leading to lifestyle changes and disruption of the family unit and community caregiving practices, and viewing memory loss and behavioural changes as a normal part of the aging process were consistent with previous work with ethnic minorities. This research points to the need to understand Aboriginal perceptions of aging and dementia in informing appropriate assessment and treatment of age-related cognitive impairment and dementia in Aboriginal seniors.

Key words: Aboriginal culture, aging, dementia, neuropsychological testing

Introduction

Aboriginal seniors (55 and older) constitute the most rapidly growing demographic group in Canada (Canstats, 2003). Because the greatest predictor of Alzheimer's disease is advancing age, research on dementia within the Aboriginal population is becoming increasingly important (Ferraro, Bercier, Holm, & McDonald, 2002). However, despite a growing body of literature on aging and dementia in minority cultures, there is a relative absence of such research with Aboriginal populations, particularly in Saskatchewan, and an extensive literature search revealed little information on dementia in Aboriginal Canadian populations in general. The importance of investigating dementia in Aboriginal groups is underscored by the current state of dementia services, which are limited in comparison to other health services; therefore, ethnic groups requiring dementia care represent an even more vulnerable subset of an already marginalized group (Means, Beattie, Daker-White, & Gillard, 2003). Although there has been little empirical research regarding the neuropsychology of normal aging and dementia with Aboriginal seniors, due to the fast growing nature of the Aboriginal population and increased life expectancy, investigation of topics that relate to the role of culture in the recognition, diagnosis, and treatment of age-related cognitive impairment and dementia is important and timely (Ferraro et al., 2002; Manly 2006). This paper describes a series of key informant group interviews with Aboriginal grandmothers that were conducted to address a gap in our current understanding of cultural perceptions of normal aging and dementia in an Aboriginal population and to explore issues related to the development of culturally appropriate assessment techniques. This research describes the first step in developing culturally appropriate assessment techniques and tools for use in a specific clinic setting.

Dementia and Aboriginal Populations

The limited extant literature on the prevalence of dementia in Aboriginal populations has provided preliminary evidence that Native American and other Aboriginal groups have a lower rate of Alzheimer's disease (AD) than European Americans, but equivalent rates of overall cognitive impairment or dementia (Hendrie et al., 1993; Rosenberg et al., 1996). However, a 1998 report from the Care Needs of Ethnic Older Persons with Alzheimer's Project concluded that AD in minority elders might not be lower but rather hidden due to current limitations in assessment (Policy Research Institute on Aging and Ethnicity, 1999). Accordingly, the previously reported low-prevalence of Alzheimer's disease among Aboriginal groups "raises questions about possible barriers to diagnosis and limitations of standard screening and diagnostic criteria" (Kramer, 1996, p. 22), and highlights the need to develop culturally appropriate screening measures and to explore cultural understandings of aging and dementia. In an exploration of the process of accessing formal healthcare from the perspective of Northern Saskatchewan communities, Cammer (2006) identified several factors as barriers to accessing formal dementia assessment and treatment services. These factors included lack of awareness of dementia, difficulty in travel to specialized healthcare services, language barriers, and distrust of Western healthcare systems. Cammer emphasized the need for developing culturally sensitive assessment tools and protocols to address the existing barriers to accessing dementia care services and to accurately determine the prevalence of dementia in Aboriginal seniors.

Cultural Perceptions of Dementia

In this paper, culture is defined as "shared basic value orientations, norms, and beliefs, as well as customary habits and way of living" (Luborsky & McMullen, 1999, p. 65). The

behavioural dimension of culture, that is the ways individuals relate with others, and behave in different contexts and circumstances (Ardila, 2005), is the primary focus of this research.

The importance of understanding cultural beliefs about normal aging and dementia is illustrated by Henderson and Henderson (2002), who state, “each individual’s talk about dementia, for example, reflects biomedical input and cultural understandings framed within the context of the person’s unique circumstances and understandings of their own experience” (p. 199). Given that culture is an important aspect of the experience of any disease, understanding possible differences in perceptions of dementia and caregiving practices is essential to providing adequate, culturally competent healthcare services. Patel (2000) suggests that cultural needs are currently often addressed only superficially, further reinforcing the necessity of conducting research in this area.

Studies with other cultural and ethnic minorities such as Latin, Asian and Black groups point to the necessity for cultural relevance and an incorporation of cultural values into assessment and treatment protocols (Daker-White, Beattie, Gilliard, & Means, 2002; Espino et al., 2001; Kane, 2000). In a qualitative analysis of Chinese-American family caregivers, Hinton, Guo, Hillygus, and Levkoff (2000) reported that dementia-related changes were construed as normal aging processes. Several other studies with ethnic minority groups in the United States describe views of dementia-related changes as typical of the normal aging process (Braun et al., 1995; Elliot et al., 1996). Chee and Levkoff (2001) found that Korean caregiver participants’ perceptions of dementing illness were informed by aspects of the biomedical model and cultural meanings of behavioural and cognitive changes. Similarly, Traphagan (1998, 2002) explored cultural components in the conception and attribution of pathological aging in Japan. In Japanese culture, one form of pathological aging, referred to as *boke*, is defined in sociocultural rather than

biomedical terms. In a study with African-American, Chinese-American, Irish-American, and Puerto Rican- and Dominican-American family caregivers in the United States, three different story types emerged: 1) Alzheimer's as a disease that erodes the core identity of a loved one; 2) aspects of dementia (e.g., confusion and disability) as expected components of growing old; and 3) dementing illness as reflective of tragic loss, loneliness, and family fragmentation due to resettlement, tragedy, or loss of filial responsibility (Hinton & Levkoff, 1999). Finally, Henderson and Henderson (2002) described a case of dementia in an American Indian family, where some of the symptoms of dementia were interpreted as "supernormal", representing communications with the supernatural world.

The importance of exploring unique perceptions within different cultural groups and within different Aboriginal populations is emphasized by John et al. (2001) who indicate that in the United States, "the cultural construction of dementia varies within and across American Indian tribes in accordance with individually held health beliefs that are part of larger cultural systems" (p. 39). Without understanding the cultural beliefs that influence perceptions, experience, and expression of dementia among Aboriginal people living in Saskatchewan, it is difficult to conduct appropriate assessments and to provide effective services to individuals. As Henderson and Traphagan (2005) point out, understanding the biocultural aspects of dementia will offer healthcare providers a rationale for improving their communication with patients and families and will facilitate improvements in patient adherence to treatment through better understanding of culturally based explanatory models of symptoms.

Culture and Neuropsychological Assessment

Assessments of both cognitive impairment and daily functioning are based on culturally dependent definitions, and are measured with assessment instruments that are influenced by

cultural and educational backgrounds (e.g., Manly, 2006). Clinical neuropsychologists must be aware of differences in cultures but also of procedures which contribute to more culturally appropriate assessment and, therefore, accurate assessment (Innes, 2001). Just as there is a necessity for cultural relevance and an incorporation of cultural values into all assessment and treatment procedures to ensure appropriate care, there is a need for culturally appropriate neuropsychological assessment. But why is cultural relevance important in geriatric neuropsychological assessment, a specialized service based on the measurement of complex higher brain functions, with a focus on differentiating age-related and disease-related cognitive change? A number of factors that are not directly related to brain functioning can influence performance on neuropsychological tests (e.g., Brickman, Cabo, & Manly, 2006). Luborsky and McMullen (1999) argue that culture “shapes the status, social setting, living conditions, and personal experiences of the elderly and contributes to many of the psychosocial and physical processes of aging” (p. 65). An emerging body of literature suggests that cultural factors also affect basic cognitive processes in important ways and that experiences have the potential to shape test performance, cognitive processes, and even neural organization (Ardila, 2005; Manly, 2008; Park & Gutchess, 2002; Park, Nisbett, & Hedden, 1999; Romero et al., 2009). Further, cognitive abilities typically measured in neuropsychological tests represent learned abilities, and scores correlate with the individual’s learning opportunities and contextual experiences (Ardila, 1995). Horton, Carrington, and Lewis-Jack (2001) emphasize that human cognitive functioning, as reflected in the brain-behaviour interaction, cannot be separated from the cultural and immediate social context in which the behaviour develops. Further, Teng and Manly (2005) point to the need to consider whether assessed cognitive domains have ecological validity for an individual’s background and life circumstances.

Psychological tests “have been conceived and standardized within the matrix of Western culture” (Nell, 2000, p. 3). Accordingly, the vast majority of neuropsychological measures that are used to assess ethnically diverse older adults have been developed for White, educated, urban-dwelling individuals (Wong & Baden, 2001). Consequently, there are methodological and conceptual limitations in using existing assessment tools in cross-cultural dementia research and assessment services. As stated, the previously reported low prevalence of Alzheimer’s disease (AD) suggests either poor detection of AD among Aboriginal seniors or a true lower prevalence of the disease when compared to majority culture epidemiological data. Thus, there is increasing recognition of the need for brief and reliable measures for use in cross-cultural dementia research and clinical assessment that are sensitive and specific for detecting cognitive impairment but are not confounded by educational or cultural factors (Glosser et al., 1993). Despite these needs, there are very few reliable, valid, and culturally appropriate assessment instruments for detecting cognitive impairment and dementia (Hendrie, 1999).

There are two main approaches to the development of culturally appropriate assessment tools designed to address some of the conceptual problems of cross-cultural dementia research. One approach, termed harmonization, includes modifying existing assessment tools in ways consistent with the culture and language of the study population (Herbert, 2001). One screening instrument, the Community Screening Interview for Dementia (CSI ‘D’; Hall et al., 1993), was developed using the harmonization method and has some demonstrated utility in cross-cultural dementia research. The CSI ‘D’ was constructed using items from standardized tools such as the Cambridge Dementia Examination (CAMDEX; Roth et al., 1986) and the MMSE (MMSE; Folstein, Folstein, & McHugh, 1975). The CSI ‘D’ includes cognitive measures and informant information about performance in activities of everyday living. The addition of the informant

information significantly improves the prediction of dementia in the screening phase (Hall et al., 2000). The CSI 'D' has been translated, backtranslated, and pilot tested in 5 sites (Cree, Caucasian, African American, Chinese, and Yoruba) and can be administered using a bilingual translator. However, the clinical application of this measure remains untested. Due to the heterogeneity of the Aboriginal population and the exclusive use of the CSI 'D' in research settings, to date, we wanted to extend the harmonization approach to modify this instrument for use in a clinical setting with Aboriginal populations from Northern and Southern Saskatchewan. The diversity of prairie Aboriginal populations cannot be over emphasized; just as there is no single language, there is no single cultural tradition (Kramer, 1996). The heterogeneity is further enhanced by the bifurcation into rural or remote populations and urban dwelling populations. Thus, consulting with Aboriginal adults from diverse backgrounds was an imperative step in ensuring that the instruments were appropriately modified for use in clinical settings in Saskatchewan.

In addition to modifying a cognitive screening tool, we also wanted to modify an existing measure of semantic memory to be culturally and geographically appropriate. Semantic memory is a type of long-term memory involving the store of culturally-shared general knowledge about the world (Tulving, 1983) and is routinely assessed as part of neuropsychological assessment. A test of semantic associations (e.g., The Pyramids and Palm Trees Test; Howard & Patterson, 1992) is useful in the early detection of semantic dementia, a subtype of frontotemporal dementia (Bozeat, Lambon Ralph, Patterson, Garrard, & Hodges, 2000). The Pyramids and Palm Trees Test requires a participant to access semantic information by examining a series of conceptually related drawings presented in triads. The target picture (e.g., pyramid) is presented above two other drawings and the participant is asked to decide which of the two drawings (e.g., palm tree

or pine tree) has the closest association to the target picture. This test has been developed for urban European populations and is subject to cultural and geographic biases that limit its usefulness in testing the semantic memory of individuals residing in rural and remote regions of North America. We wanted to modify this instrument to make it culturally and geographically appropriate for ethnically diverse older adults referred for neuropsychological assessment services.

The goal of the present study was to contribute to knowledge of Aboriginal perceptions of aging and dementia to guide the development of culturally appropriate assessment procedures. Thus, the aims of this study were two-fold: 1) to gain an understanding of the cultural perceptions of aging and dementia and unique experiences in dementia caregiving, and 2) to modify existing assessment instruments for the purpose of developing a culturally appropriate assessment protocol. To address the goals of our project, we consulted with members of an Aboriginal Grandmothers Group who had experiences in providing care to Aboriginal seniors living in rural and remote regions.

Method

Setting and Context

This project was funded through a Canadian Institutes of Health Research New Emerging Team (NET) project, entitled, “Strategies to Improve the Care of Persons with Dementia in Rural and Remote Areas.” The flagship project of the NET involves the development, implementation, and evaluation of a Rural and Remote Memory Clinic (Morgan et al., 2009). The clinic involves a one-day, streamlined multidisciplinary assessment in Saskatoon and pre-clinic assessment and follow-up using telehealth video-conferencing. Because referrals to the clinic include rural-dwelling older adults from both majority and non-majority cultures, including Aboriginal

seniors, this research was important in establishing a culturally appropriate dementia assessment service, tailored to the specific needs of ethnic minority groups with cognitive impairment. This project highlighted the need to engage in research with Aboriginal persons in order to provide adequate and specialized services and, at the same time, represented an opportunity for conducting such research. We had full ethics review and approval at the university level, and by the board of directors at the Saskatoon Community Clinic and the larger Grandmothers Group.

Participants

To examine Aboriginal perceptions of normal aging and dementia and to guide the modification and development of a culturally appropriate clinical protocol, participants were recruited from the Saskatoon Community Clinic Grandmothers Group in Saskatchewan, Canada. The Grandmothers Group is comprised of Aboriginal seniors who regularly meet for education sessions, community advocacy, and social gatherings. The group is facilitated by an Aboriginal counselor. Initially, a partnership was formed with the facilitator, who identified four volunteers from the Grandmothers Group who had extensive experience as healthcare providers in rural and remote regions of the province. One Grandmother who participated in the initial interview was not able to continue due to employment conflicts. Consequently, three Aboriginal Grandmothers participated in six key informant group interviews, taking place on a monthly basis. The groups were held at the Saskatoon Community Clinic. Preceding each of the six groups, the participants signed a written consent for participation (see Appendix A) and were provided with a small honorarium. Additionally, transportation was provided for each meeting. The Grandmothers were from diverse backgrounds, including Cree, Salteaux, and Métis, which appropriately reflect the heterogeneity of Aboriginal populations in Saskatchewan. Participants also varied in the languages they spoke fluently. One Grandmother spoke Plains Cree, Mitchif Cree, French, and

Salteaux. All of the Grandmothers were fluent in English. The Grandmothers ranged in age from 59 to 73 years. Also beneficial was the diversity of the Grandmothers' geographical experiences. Although all Grandmothers currently reside in an urban environment, one of the Grandmothers was raised in a rural southern area of Saskatchewan and her early history was characterized by the residential school experience. The other two Grandmothers were raised in remote Northern communities. Because the researchers were active participants in the key informant group interviews, English was the predominant language spoken during the groups; however, the Grandmothers often spontaneously spoke Cree to one another and would then translate their communications to the researchers. This occurred when the Grandmothers had difficulty selecting the appropriate word in English and when a story was told that was humorous or "sounded better" in Cree.

Data Collection and Analysis

The six monthly key informant group interviews (Denzin & Lincoln, 2005) provided a framework for exploring the experiences of the Aboriginal Grandmothers in the areas of aging, dementia, and caregiving. This paper is based on the data collected from the transcripts of the interviews. Because the Grandmothers expressed that they were not comfortable with having the sessions tape-recorded, a co-author (AC) was present for each key informant group interview to transcribe the conversation. The discussions were framed with several semi-structured questions about caregiving experiences, perceptions of aging, and conceptions of dementia within Aboriginal communities. During the groups, we shared humour, personal stories (both profoundly serious and light-hearted), and reviewed the assessment instruments. Each discussion took at least three hours and was a very social and enjoyable affair. Beverages and homemade snacks were provided by the researchers and were shared during breaks that were scheduled

midway through each discussion. The Grandmothers rated this sharing of food and beverages positively in their informal evaluations of the key informant group interviews, and this component of the group often was accompanied by lively, spontaneous, and rich discussion.

Qualitative thematic analysis (Luborsky, 1994) was conducted on the data to identify the themes that arose from the discussions. It was assumed that the small sample would yield sufficient data because each participant had the potential to provide information on experiences of caregiving, dementia, and assessment. Each volunteer had been involved in caregiving either as a health practitioner or as someone who had cared for a relative with dementia. Thematic analysis was chosen for this project because it directly represents an individual's personal point of view and "descriptions of experiences, beliefs, and perceptions" (Luborsky, 1994, p. 190), and because it is able to provide an in-depth description of preliminary themes related to Aboriginal perceptions of dementia and care practices for dementia. As outlined by Luborsky (1994), themes are defined as the "manifest generalized statements by informants about beliefs, attitudes, values, or sentiments" (p. 195). Themes were identified by examinations of emphasized statements that occurred most frequently or with increased emphasis. The iterative process of analysis began after the first two key informant group interviews, where several candidate themes were co-constructed by the researchers and the Grandmothers through discussion and review of the data. These themes included the role of traditional lifestyle and family in healthy aging, and the need for culturally competent medical practices. Consistent with Luborsky's guidelines, several readings of the transcripts aided in elucidating recurrent and important topics. On subsequent readings, descriptive labels, which included notes of main points and topics were written within the margins. First, descriptive codes were assigned to units of transcribed data. Next, coded passages were grouped together in categories. These were later compiled to identify

candidate themes for further inquiry. We made an effort to identify alternate possibilities for interpretation of recurrent statements and discussion, and to ascertain whether these arose as a result of the participants' interaction or other factors, such as ethnic differences in speech style (Luborsky, 1994). Theoretical saturation (Strauss & Corbin, 1990) was established when rereading the text revealed no further information or new topics, and later discussions yielded no new emerging information but reaffirmed past discussions. The trustworthiness of the data was maximized by having the Grandmothers review the transcripts after each key informant group interview and then offer revisions and modifications in order to ensure their voice was adequately represented by the transcripts.

Results

In analyzing the qualitative data from the project, we identified three related themes that highlighted the Grandmothers' experiences of aging, caregiving, and dementia within their communities. Related perceptions of normal aging and dementia, with emphasis on expectations of normal aging as "going back to the baby stage", and a fear of dementia, comprised a prominent theme. A second overarching theme of a "big change in culture" pervaded the Grandmother's descriptions of Aboriginal health, illness (including dementia), and aging. Thirdly, the importance of culturally grounded healthcare was identified as a salient theme, often specifically related to review of assessment tools, but also within the context of a more general discussion on the topic of dementia and experiences with the healthcare system. Within each of these themes, several sub-themes were identified and will be discussed.

Perceptions of Dementia and Normal Aging

The Grandmothers indicated that there is no specific Cree word or term for dementia. The Grandmothers described that "losing your memories" is the only phrase that captures dementia in

the Cree language. One Grandmother also described someone later recognized as having dementia as “not with her mind.” However, when describing members of their communities who would likely be diagnosed as having dementia, the Grandmothers described symptoms similar to those typically reported in the majority culture. For instance, one Grandmother described wandering behaviour in an older male in her community and hoarding behaviour in an older woman, who continuously made bannock and then hid this under her mats.

Consistent with perceptions of dementia as a normative process of aging rather than a disease process, the Grandmothers talked of aging as “going back to the baby stage”, thus illustrating the “circle of life” and the importance of circular symbols within Cree culture. This theme also emphasizes the conception of dementia-related cognitive and behavioural changes as part of a normal process of aging. Similar to majority culture family caregiving, there was also discussion of the worry and fear related to the idea of dementia. One Grandmother described caring for her mother who had dementia and her own fear of the disease, stating “I sometimes have a feeling that I am picking up what my mother had and this is a worry for me. I don’t want to be like her.”

The Influence of a Changing Culture

The Grandmothers spoke frequently and at length about the “big change in culture” with the advent of motorized vehicles, increased road access to remote Aboriginal communities, and community changes following the First and Second World War, all resulting in an “increased pace of life.” The topics that were identified within this overarching theme centered on changes

within the Aboriginal family system which exacted changes in the caregiving and family structure, and on traditional diet and cultural practices¹.

The theme of the “big change in culture” frequently included the topic of caregiving for relatives. When describing family systems and functioning, the Grandmothers frequently repeated the word “structure” and used it to compare the perceived changes in caregiving practices and family integrity. The Grandmothers spoke in a nostalgic sense about traditional care practices and the importance of community when caring for loved ones with cognitive impairment. For example, when asked about current caregiving practices for a family member with dementia, one Grandmother stated:

...depends how structured families are. Families aren't as close now since all the things that have come into their lives--the residential schools and all that. But there still are families that are close and they still care for elders. Less than before.

Community caregiving was discussed in a nostalgic manner as a positive method of caregiving and described as a less frequent practice currently. One grandmother described: “Traditionally, communities were more supportive and intertwined. There was a woman in her 80s who had dementia and the whole community knew her and would help her. If they saw her wandering, they would take her home.”

The Grandmothers compared the changes that have affected Aboriginal family units with the more positively described traditional aspects of aging and elder care:

A long time ago a family was a family and the grandparents were very respected. But now the young people are educated elsewhere--off the reserve--and they have to go elsewhere to get a job. As for reserves, it is changing a bit because there is homecare

¹ The following is an addendum to the manuscript in press and clarifies the use of the term “cultural practices.” When describing cultural practices, the Grandmothers specifically referred to hunting and trapping, fishing, eating wild game, and spending time with their families.

where there never was before. Still, the families are close...but alcohol and drugs--it has a good hold in the family and ruins things.

This theme also was identified in discussion of normal aging experiences, which was often described as inextricable from the family context in the past. For instance, the Grandmothers emphasized the isolation in the experience of aging in current society. One Grandmother stated: "Lots of the Grandmothers I visit are loners--they say their grandchildren don't visit and they feel isolated--that's why I feel isolated." Further, the aging process and perceptions of aging appear to be shifting with changes in culture, which have led to a loss in the traditional way of life. Dementia was previously thought of as rare and the Grandmothers could only think of a few people in their home communities who suffered from cognitive impairment in late life: "In the old, old people I hardly know of dementia or Alzheimer's in them...was it that the pace was so slow and we had such time and it wasn't a rat race--did that affect lifestyle and illness?"

The changes in lifestyle described by the Grandmothers were clearly linked to increased illness within the Aboriginal population. A salient sub-theme that was identified with the notion of the "big change in culture" was that of the loss of traditional lifestyle, which resulted in increased stress and illness. One Grandmother stated:

Stress causes illness, we know that. And look at the Aboriginals today and what they are going through: hypertension, diabetes. And they are dying younger because of the diabetes and heart problems and asthma. Those are the kinds of illnesses we have now because we are getting older and the pace of life has changed dramatically.

In addition to the role of stress in increased illness, additional factors related to illness identified by the Grandmothers were changes in diet and in physical exercise. These topics were

recurrent throughout the key informant group interviews. They linked changes in traditional diet and health practices to illness and dementia. The Grandmothers frequently spoke about the nutritional content in traditional food and what was consumed in comparison to the typical modern diet. For example, as road access was extended to northern communities, there was increased access to “junk food” and less reliance on traditional food and traditional methods of food gathering, which often were a significant source of physical exercise. Regarding physical exercise, one Grandmother stated: “I think the trend has changed. Before you used to scrub the floors, and clean, and walk and walk compared to now.”

The Importance of Culturally Grounded Healthcare

Within the theme of culturally grounded healthcare, several salient topics were identified. First, in describing assessment in the context of culturally appropriate healthcare, what emerged was the importance of sensitivity in communication, rich visual images in conveying information or assessing functions, and ensuring familiarity and relevance of assessment items. Second, the importance of language and in particular, translation services, as well as the prominence of humour in language was elucidated by the Grandmothers. In terms of the language and content of assessment items, the Grandmothers indicated that culturally appropriate items are foremost in developing rapport and in conducting an accurate assessment. For example, in a description of her experience accompanying a family member to a medical appointment, she stated, “I think it’s the way they ask her questions that she has trouble with.” An illustration of the importance of sensitivity in communication was provided by one Grandmother:

There was a male nurse from New Zealand who had never seen an Aboriginal from Canada and asked, ‘What do I expect, how do I approach people in the community?’

Be yourself, do your work well, be honest with the people, do what you are supposed to and people will respect you. The nurse stayed seven years.

The role of rich visual images was mentioned frequently by the Grandmothers in their discussion of assessment and conveying medical information. The Grandmothers emphasized that evocative colour images are necessary in evoking an older adult's interest and engaging them in the assessment process. In describing her own successes as a healthcare provider, one Grandmother described the need for creativity and visual images:

And we'd have a picture of the anatomy in colour and it's really eye-catching and it really draws you in too. Catches the interest...We used lots of things with animals--and there's lots of words, even in diabetes, that you don't have a word for in Cree, so you need to come up with something.

Central to the concept of culturally competent healthcare, the Grandmothers made repeated references to the importance of language in creating comfort in the healthcare environment. One Grandmother described, "You know when it comes to assessment, I think this is where the language comes in handy--to be really specific so that this person you are assessing will understand and be relaxed." The Grandmothers made repeated reference to the importance of language and translation services within healthcare settings and provided stories that described a breakdown in communication and quality of healthcare because of language barriers between a patient and a healthcare provider. The need for translation or language services in healthcare was often addressed humourously:

I think it is very important to have a translator. This elderly man went to the doctor and when he went home he said to his son that a horse was on his liver. The son

phoned the nurse and asked what his diagnosis was and she said it was cirrhosis of the liver. Close but you need a translator.

The same Grandmother later told another story in a humourous manner about a miscommunication between a healthcare provider and a patient due to language barriers:

Some nurses they get careless and maybe they are overworked...and they'll send in a 12 year old boy to translate for grandpa. Like the one who had prostate cancer...they told the boy to tell the grandpa that they were going to give him two shots right away and the boy didn't know the words so he told his grandpa that they were going to shoot him twice right now. So the grandpa says that 'I guess there is no hope then'!

The Grandmothers spoke at length about the humour inherent in the Cree language. One Grandmother commented: "Humour is an important part of our culture. Cree language is very humourous."

In discussion of the specific screening and assessment tools, the CSI 'D' (Hall et al., 1993) and the Pyramids and Palm Trees Test (Howard & Patterson, 1992), the theme of culturally grounded healthcare and the importance of language and appropriateness of items pervaded the discussion. The Grandmothers aided in further modifications to ensure cultural and geographical relevance. In particular, for the Pyramids and Palm Trees Test, the theme of culturally grounded healthcare and the importance of culturally relevant assessment instruments led to the development of 60 exemplars using familiar colour photo stimuli, instead of the black and white line drawings employed in the original test. Thus, with the guidance of the Grandmothers, the "Grasshoppers and Geese Test" was developed as a culturally and geographically appropriate modification of the Pyramids and Palm Trees Test. In generating new triads, discussion of the stimuli often evoked stories about the stimuli and their role in Aboriginal

culture or the geographical landscape. Thus, we anticipated that this instrument would also prompt conversation and relaxation in clinic patients who were completing this measure. The further modifications made to the CSI 'D' focused primarily on semantic changes to items, in order for the instrument to be more easily translated from English to Cree and to ensure ecological validity and appropriateness of items for individuals who were illiterate. The Grandmothers emphasized the need to modify or remove items that would assume or require any formal education or exposure to urban culture.

In summary, although the experiences of the Grandmothers differed from one another and were often dependent on geographical background, these data suggest common core cultural perceptions of aging and dementia identified by a group of Aboriginal Grandmothers. Additionally, perceived changes in culture are thought to underlie the increase in illness among Aboriginal seniors and to negatively impact the process of aging. Another theme that was identified was a strong need for improved culturally grounded healthcare, including assessment tools which are visually appealing and familiar.

Discussion

Understanding cultural perceptions of normal aging and dementia, and of dementia caregiving within Canadian Aboriginal populations, represented largely exploratory work. The key informant group interviews with the Grandmothers provided an opportunity for this exploratory work and yielded much important information on the Grandmothers' experiences with aging, dementia, and dementia caregiving. One clear theme identified was the perception of changes in memory and behaviour as aspects of the normal aging process and the related view of circularity, which is a prevalent symbol within Aboriginal culture. The Grandmothers' description of the aging process as "going back to the baby stage" is consistent with the circular

conception of the lifespan within Aboriginal culture. Previous research has identified similar patterns in other cultures that view memory loss in older adults as a normal part of the aging process, referring to this stage of life as a “second childhood” (e.g., Kramer, 1996; Hinton et al., 1997). Interestingly, the changes described by the Grandmothers that were attributed to unhealthy aging were consistent with symptoms of dementia endorsed in the majority culture (e.g., hoarding, wandering). Traphagan and colleague’s research on cultural perceptions of dementia in Japan also showed that the symptoms and behaviours described were generally similar to biomedical diagnostic features of dementia (Traphagan, 1998; 2002; Henderson & Traphagan, 2005).

A second theme that was identified emphasized that the recent loss of traditional practices and ways of life has profoundly impacted views of normal aging and caregiving roles. The sense of increased illness and age-related diseases was strongly linked to changes in lifestyle which represent a deviation from a positively viewed traditional lifestyle, focused on healthy diet through consumption of traditional foods and physical exercise. Indeed, Saskatchewan Aboriginal communities have undergone substantial sociocultural change with increased road access to remote communities, creation of reserves, residential schools, and changes when veterans returned to communities after the Second World War. These changes, which have influenced family structure, diet, and traditional practices, were linked to changes in the normal aging process, which now are characterized by loneliness and illness. This perception of aging and illness is similar to a subset of Puerto-Rican and Dominican family caregivers residing in the United States, whose stories of the nature and meaning of dementia highlighted the link between traumatic lifestyle changes, loneliness, and changes in family caregiving responsibilities and Alzheimer’s disease and dementia (Hinton & Levkoff, 1999). In the context of dementia care and

treatment, the notion of traditional community caregiving was identified as a consistent theme. Kramer (1996) argues that Aboriginal populations in the United States value the interdependence of family and community. This was evident in the Grandmothers' discussions of care for elders with dementia, perceiving the family unit and the community as a whole as caregivers. Changes in family dynamics and loss of filial responsibility, related to the "big change in culture," have disrupted this practice.

It was evident from the results of the key informant group interviews that barriers to competent healthcare and assessment still exist. This finding was consistent with Cammer's (2006) research which identified the perception of healthcare systems as culturally insensitive for Northern Saskatchewan community residents. Although the examples described by the Grandmothers were often humorous, there was a clear message that barriers in communication and cultural sensitivity continue to affect Aboriginal individuals' experiences of the healthcare system. This theme also directly informed the modifications of the test of semantic association (The Pyramids and Palm Trees, renamed by the Grandmothers as the Grasshoppers and Geese Test) and the cognitive screening instrument (CSI 'D'). The importance of incorporating engaging and colourful images, humour, and familiar images into test stimuli was highlighted in the Grandmothers' discussions of culturally competent healthcare and when directly viewing the original test stimuli. Subsequently, the G&G and revised CSI 'D' were pilot tested and administered to a normative sample in order to further modify the test stimuli into a final measure. Normative and clinical validation data have been collected with the final measures and will be described in future publications.

It is important to mention the limitations of this analysis. Our qualitative analysis is based on a small and selective sample and is not intended to be representative of the larger

Aboriginal population. Yet, the recurrence of themes in the key informant group interviews suggests that these themes provide a preliminary description of Canadian Aboriginal perceptions of health, aging, and illness in the context of sociocultural change.

Qualitative analysis of the key informant group interviews facilitated the development of culturally appropriate clinic procedures, and the revision of assessment protocol to reflect Saskatchewan Aboriginal identity and experience. These changes will ultimately increase the appropriateness of the assessment process and the accuracy of diagnosis within the Rural and Remote Memory Clinic, and will facilitate appropriate interventions that incorporate a culturally-based understanding of dementia in Canadian Aboriginal persons. We have learned much about the importance of humour, colour, and natural images in the development of appropriate assessment procedures and these qualities are finding their way into our modified protocols (Crossley, Lanting, Lejbak, & Corney, 2005). Understanding cultural contributions to the perception of aging and dementia and developing and evaluating culturally appropriate dementia screening instruments are preliminary steps in addressing the current lack of data regarding the prevalence and nature of cognitive impairment and dementia among Aboriginal seniors.

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RUNNING HEAD: COGNITIVE SCREEENS FOR ABORIGINAL SENIORS

Study 2: Modification of two cognitive screening measures for increased sensitivity and culturally competent assessment of Aboriginal seniors: Preliminary evaluation through a series of case studies

(under review, *International Geriatrics*)

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Abstract

Currently, there are both methodological and conceptual limitations to conducting neuropsychological screens and evaluations for dementia with individuals who are members of cultural and/or linguistic minority groups. Overcoming these limitations is essential to meet the clinical needs of increasing numbers of ethnically diverse older adults and in order to conduct accurate epidemiological research. Several instruments have been developed to address the cultural bias of commonly used measures such as the Mini Mental State Examination (MMSE; Folstein, Folstein, & McHugh, 1975). In the current study, two of these measures, the Community Screening Interview for Dementia (CSI 'D'; Hall et al., 1993) and the Cognitive Abilities Screening Instrument (CASI; Teng et al., 1994) were further modified for clinical use in consultation with a group of Aboriginal grandmothers, and pilot tested with four Aboriginal older adults who were referred to a Rural and Remote Memory Clinic. Overall, performance was consistent across the two screening measures and in keeping with the interprofessional team diagnosis, based on assessment by neurology, neuroradiology, neuropsychology, geriatric medicine, and physiotherapy. The screening measures were well-received by both the Aboriginal patients and their family members. Remaining limitations of the instruments included the evident education and cultural bias of some test items, and the need for at least a minimal level of literacy to complete the full CASI and to generate an estimated MMSE score.

Introduction

When conducting neuropsychological screens and evaluations for dementia with individuals who are members of cultural and/or linguistic minority groups, there is a risk of committing diagnostic or interpretative errors. Most neuropsychological tests were designed for and evaluated on Caucasian, English-speaking persons from the United States (Manly, 2006; Manly, 2008; Rivera Mindt et al., 2010; Romero et al., 2009). Very few tests have been designed for and evaluated on persons who have different cultural and/or language backgrounds. Non-representative test items or norms can lead to biased or inaccurate conclusions and individuals from different ethnic groups often perform differently on standard intellectual and neuropsychological tests (Manly, 2006). Some of the proposed explanations for these group differences include: (1) the test is culturally-biased in favour of one ethnic group or another; (2) there are differences between ethnic groups in important demographic variables, such as education, and socioeconomic status, that can have an impact on test performance; and, (3) there are real differences between groups in the underlying ability or skills assessed by the particular test (Brickman, Cabo, & Manly, 2006). Although it is difficult to determine exactly why certain ethnic groups perform differently on tests of cognitive ability, it remains important for clinicians to develop measures that have adequate reliability and validity, and are appropriately normed for different linguistic, ethnic, and cultural groups. The purpose of this study was to address the current lack of available cognitive screening instruments for Aboriginal Canadian seniors by further adapting the Community Screening Interview for Dementia (CSI 'D'; Hall, et al., 1993) and the Cognitive Abilities Screening Instrument (CASI; Teng et al., 1994), and assessing their utility for clinical use with Aboriginal seniors residing in rural and northern regions of Saskatchewan. We evaluated these two screening tools in a clinic setting through a series of case

studies of patients of Cree background who were administered both modified instruments as part of a full-day interprofessional dementia team assessment (Lanting, Crossley, Morgan, & Cammer, in press; Morgan et al., 2009; Morgan et al., 2010). The Cree are the largest group of First Nations in Canada with over 135 registered bands. There are five major dialects, including Northern/Woodlands Cree and Michif Cree, which were the languages of the participants (Grant, 2000).

The methodological and conceptual limitations of using existing assessment tools for cross-cultural dementia and normal aging research, and for conducting valid assessments with ethnically diverse seniors are highlighted in research findings with the Mini-Mental State Examination (MMSE; Folstein, Folstein, & McHugh, 1975). This instrument, which is the most readily available screening tool for cognitive impairment, is used by clinicians to make diagnostic decisions and to determine the need for more comprehensive evaluation of cognitive functioning. However, the standard cutoff score on the MMSE (i.e., 23/30) often results in over-diagnosis of dementia among minority populations, even after controlling for years of education (see Manly, 2006 for review of ethnic differences in performance on the MMSE). Several research groups have responded to the need to identify and develop measures that are sensitive to cognitive impairment across broad educational and culturally diverse backgrounds by developing alternate screening tools that are appropriate in different cultural contexts. Because collecting separate norms for existing measures may not adequately address the variability inherent in race, culture, and education that underlies differences in cognitive test performance, these alternate screening measures were created in order to more appropriately assess cognition in ethnically diverse seniors. Some of these screening instruments have been developed using the harmonization method, which includes modifying existing assessment tools in ways consistent

with the culture and language of the study population (World Health Organization, 1990), and have demonstrated utility in cross-cultural dementia research.

One such instrument, the Community Screening Interview for Dementia (CSI ‘D’), developed by Hall and colleagues (1993), was designed for community-based epidemiological studies, and was the first cognitive screening instrument developed to detect dementia in populations with very different cultural and linguistic identities. The CSI ‘D’ has been translated into Cree and its utility as an epidemiological tool has been demonstrated for Cree populations in Manitoba, Canada, although the clinical application of this measure remains untested (Hall et al., 1993). The CSI ‘D’ is a compilation of widely used dementia assessment instruments, which were harmonized and standardized for use in several languages and modified to address the educational bias of existing measures. For example, the CSI ‘D’ was constructed using items from standardized tools including the Cambridge Dementia Examination, the Dementia Rating Scale, and the MMSE (see Hall et al., 1993, for test references), and includes informant assessment about daily functioning. The CSI ‘D’ has been translated, back-translated, and pilot tested in five sites (with Cree, Caucasian, African American, and Yoruba populations), demonstrating utility across cultures and different socioeconomic backgrounds (Hall, 2000; Hall et al., 1996; Prince, Acosta, Chui, Scazufca, & the 10/66 Dementia Research Group, 2003).

Another modified screening tool is the Cognitive Abilities Screening Instrument (CASI; (Teng et al., 1994). The CASI was developed for a coordinated epidemiological cross-cultural study of dementia in the U.S. and Asia. Teng and her colleagues started with the most common dementia screening instruments in the U.S. and Japan, and merged and modified the items to improve cross-cultural applicability, reliability and sensitivity. The modified screening instrument is an adaptation of the MMSE and the Hasegawa Dementia Screening Scale (see

Teng et al., 1994 for test references) and has been translated into Chinese, Japanese, and Spanish. It has been modified to take into account variations in educational background and other factors that can potentially affect test results in minority cultures. This screening instrument has not been used with Aboriginal populations but demonstrates potential adaptability as Teng has encouraged researchers to further modify test items that are used to assess specified domains in order to better suit their participants' backgrounds (Teng, 1999).

With increasing life expectancy among non-majority populations, new information regarding culturally appropriate neuropsychological test construction and assessment is crucial, because these bodies of knowledge will have an impact on not only dementia screening and clinical diagnosis, but also on accurate epidemiological research. An emerging body of literature recognizes the need to better understand aging and dementia in minority cultures (Cattarich, Gibson, & Cave, 2001; Manly, 2006; Park & Gutchess, 2002; Wolfe, 2002; Wong & Baden, 2001). Despite this increase in cross-cultural research, there remains a relative absence of such research with Aboriginal populations, particularly in Canada (Jervis & Manson, 2002). Although extant research is suggestive of a lower prevalence of Alzheimer's Disease (AD) in Canadian Aboriginal populations (Hendrie, 1999; Hendrie, 1993), a 1998 report from the Care Needs of Ethnic Older Persons with Alzheimer's Project concluded that AD in minority elders might not be lower but rather hidden due to current limitations in screening and assessment (Policy Research Institute on Aging and Ethnicity, 1999). This highlights the need to develop culturally appropriate screening measures and to explore cultural influences on perceptions of aging and dementia.

Method

Pilot Testing and Revisions to the CSI 'D'

Two clinic patients who had been referred to the Rural and Remote Memory Clinic were administered the unmodified CSI 'D'. Pilot testing with these participants within a clinic setting highlighted the need for additional items to be added in order to generate estimated MMSE and Modified Mini Mental State Examination (3MS; Teng & Chui, 1987) scores, which is considered important in an interprofessional clinical setting. Next, expert review by three members of an Aboriginal Grandmothers Group resulted in several revisions designed to increase the cultural appropriateness of these instruments for Cree-speaking Aboriginal older adults residing in rural or northern regions of Saskatchewan (Lanting et al., in press). Specifically, when reviewing the instrument, the Grandmothers suggested revisions focused primarily on semantic changes to items, in order for the instrument to be more easily orally translated from English to Cree dialects during the administration of the screening tool. Semantic changes were also required to ensure the ecological validity and appropriateness of some items for individuals who did not have more than a few years of formal education or exposure to urban culture. For example, the sentence in the original CSI 'D' (and in keeping with the MMSE) that tests oral repetition was changed from "no ifs, ands, or buts" to "the sun is rising in the East." Additional changes made included minor wording changes (e.g., replacing "elderly" with "older adult") and modification to the test instructions in order to make them more easily administered with use of a translator. Although the original CSI 'D' was developed in English and Cree, we modified the items in English and worked with the Grandmothers to ensure that the stimuli could be translated into Cree during the assessment. We did not include a written version in Cree due to the Grandmothers indication that, because of the multiple dialects of Cree and the requirement that

the translator be literate, the instrument should be translated orally from the examiner to the translator to the patient. For language expression (e.g., definitions), the question “What is a bridge?” was changed to “what is a table” because the Grandmothers stated that this was more easily translated into Cree. A delayed recall section was added in order to increase the sensitivity of the screening tool, and in keeping with the 3MS procedures. See Appendix B for a description of changes made to the original CSI ‘D’. Consistent with previous work (e.g., Cattarich et al., 2001), the Grandmothers emphasized that the process of the assessment was critical, including the manner in which the questions were asked and ensuring a comfortable, informal environment. Pilot testing with the modified CSI ‘D’ was then conducted with three additional clinic patients following review of the instruments by the Aboriginal Grandmothers Group.

Participants

Four Cree-speaking Aboriginal seniors referred to the Rural and Remote Memory Clinic and administered the modified CSI ‘D’ and the CASI as part of their assessment were selected as case studies for the current research. All participants and their caregivers provided either written consent or oral assent to participate in the research conducted at the Rural and Remote Memory Clinic, which was approved by the University of Saskatchewan Behavioral Research Ethics Committee. These participants are described in the Results section below.

Materials

Community Screening Instrument for Dementia – modified version (CSI ‘D’ Modified). The original CSI ‘D’ has two parts: a cognitive section for the participant and an interview with an informant about daily functioning and general health of the participant. In developing the original CSI ‘D’, items from several widely used dementia instruments were reviewed for their suitability in assessing higher brain functions (e.g., memory, abstract thinking, constructional

ability). Items from the original tests were evaluated by Hall and colleagues for usefulness with seniors with low reading and writing skills and were adapted, tested, and sometimes further modified to be meaningful in local language and culture. The cognitive section consists of 39 items and takes approximately 20 minutes to administer. The informant section consists of 30 items and takes approximately 15 minutes to administer. The original instrument was tested for acceptability, comparability, reliability, validity, and analyzed to obtain a discriminant function score and to determine a cut-off score for dementia. Hall et al. (1993) also provided the percentage answered correctly for items in a sample of Cree individuals who were diagnosed with dementia ($n = 7$) and a group of individuals without dementia ($n = 47$). See last two columns in Tables 1 and 2 for these data.

Cognitive Abilities Screening Instrument (CASI). The CASI consists of 25 test items and takes approximately 15-20 minutes to administer. The CASI provides a total score of 100 but includes items identical or very similar to those used in the MMSE and 3MS. Therefore, in addition to providing CASI domain and total scores, the instrument can also yield estimated scores on the MMSE and 3MS. Although many of the items from the original CASI underwent considerable modification from the MMSE in order to improve reliability and validity, the estimated MMSE score has been found to be very close to the score obtained from an independently administered MMSE (Graves, Larson, Kukull, White, & Teng, 1993).

Procedures

Participants were assessed through the Rural and Remote Memory Clinic in Saskatoon, Saskatchewan. The development, implementation, and evaluation of the Rural and Remote Memory Clinic was the flagship project of a Canadian Institutes of Health Research New Emerging Team (NET) grant, entitled “Strategies to Improve the Care of Persons with Dementia

in Rural and Remote Areas” (Morgan et al., 2009; Morgan et al., 2010). The clinic involves a one-day, streamlined interprofessional assessment in Saskatoon and pre-clinic assessment and follow-up using telehealth videoconferencing. Referrals to the clinic include Aboriginal older adults from remote reserves and communities, necessitating a culturally appropriate dementia assessment service that is tailored to the specific needs of ethnic minority groups with cognitive impairment.

Each participant was administered the modified CSI ‘D’, the CASI, and additional neuropsychological measures, including a newly developed battery for use with ethnically diverse older adults in Saskatchewan. The Grasshoppers and Geese Test Battery (G&G) (Lanting, Crossley, & Morgan, 2007) includes measures of semantic, episodic recognition, and prospective memory, and confrontational naming. Participants were also administered other neuropsychological measures where applicable, including the 3 Dimensional Block Design (Benton & Fogel, 1962), and Line Orientation, Figure Copy, and Recall subtests of the Repeatable Battery for the Assessment of Neuropsychological Status (RBANS; Randolph, 1998).

Family members provided translation services as needed. Each patient was evaluated by a neurologist, neuroradiologist, neuropsychologist, geriatrician and physiotherapist during a one-day interdisciplinary assessment. Diagnosis was established by consensus during an end-of-day team meeting and was based on data available from all disciplines, including from clinical and family interviews.

Results

Case 1: GL

Background. GL is a 75-year-old retired welder and mechanic referred for an assessment from a northern community because of reported memory changes. His first language is Cree

although he is partially fluent in English. He was accompanied to the clinic by his spouse and daughter. His subjective history included recent memory changes and low mood. His medical history was positive for hypertension, and he had been diagnosed with herpes zoster in the month prior to his assessment. He completed two years of education in a residential school with some additional education in his adult years that enabled him to read basic words and to print his name.

Assessment Findings and Diagnosis. GL's neurological examination was normal. CT findings included diffuse cerebral and cerebellar volume loss that was slightly more than expected based on normal age-related changes. There were also small vessel ischemic changes. On neuropsychological measures, he showed impairment on naming ability, episodic recognition memory, prospective memory, and access to his semantic store of knowledge. His performance was also impaired on constructional and spatial measures. His consensus diagnosis was Alzheimer's disease.

Screening Measures. GL's family members provided translation services. His CASI-estimated MMSE score was 16/28 (the writing and reading sections were not attempted). He lost points on reversal, recall, orientation (year, date, and day of the week), sentence repetition, and pentagons. His CASI-estimated 3MS score was 43/92. Similarly, on the modified CSI 'D' (see Table 1), GL had difficulty with short-term memory items, language comprehension, construction, and orientation (spatial and temporal). As shown in Table 2, his spouse and daughter endorsed difficulties in the areas of memory functioning, word-finding, and higher-order activities of daily living (ADLs; e.g., independent financial management) on the informant measure. No changes in personality or mood were noted. The screening measure data were

consistent with other neuropsychological findings and showed similar patterns of impairment (e.g., impairment in a number of domains, including memory).

Case 2: FB

Background. FB is a 68-year-old retired natural resource officer living in a northern community. He was referred due to a six month history of memory difficulties. He had a myocardial infarction two years prior to the assessment. He also had a remote history of transient ischemic attacks and an angiogram revealed 50% stenosis of the right internal carotid artery (ICA). He described minor subjective memory changes but expressed more concern regarding his physical symptoms. There were no reported functional changes by either the patient or his son. He also described a previous history of heavy alcohol use. He completed Grade 5 but left school to assist his father with fishing and trapping duties. His first language is Cree; however, he is fully fluent in English.

Assessment Findings and Diagnosis. FB's neurological examination was normal with the exception of a left up-going plantar reflex. A CT scan revealed an "old infarct" in the right temporal lobe and a newer left frontal infarct. On neuropsychological testing, he showed impairment in episodic recognition memory, prospective memory, and semantic memory. In contrast, his language functioning, and spatial and constructional abilities fell within the normal range, with the exception of lower than expected performance during confrontational naming and speeded verbal fluency. His consensus diagnosis was vascular cognitive impairment, no dementia.

Screening Measures. FB's CASI-estimated MMSE score was 27/30. He lost points on recall, orientation (day of the week), and writing. His CASI-estimated 3MS score was 85/100. On the modified CSI 'D', he had difficulty with short-term memory and pentagons (see Table 1).

He had one incorrect answer on abstract thinking and was not oriented to day of the week. Overall, however, he performed well on the CSI 'D'. The informant portion was not administered but on interview, FB's family member endorsed mild forgetfulness but no significant changes in activities of daily living (see Table 2). No personality or mood changes were noted. FB generally performed well on the screening measures (above traditional cut-offs) and his performance on these measures supported the diagnosis of mild cognitive impairment.

Case 3: VE

Background. VE is a 66-year-old Cree speaking female who was referred from a northern community secondary to behavioural and memory changes. She was accompanied to the assessment by her daughter. VE reported a subjective two year history of memory difficulties. She also reported a 20 year history of depression, which included previous hospitalizations. Additionally, she had at least one previous admission for addiction-related treatment. Regarding medical history, she had been diagnosed with diabetes, hypertension, and arthritis. She completed five years of education in a residential school setting. Her psychosocial history included experiencing physical abuse in her marital relationship. She was functionally fluent in English, although her daughter provided translation services as necessary.

Assessment Findings. VE's neurological exam was normal, with the exception of absent knee extension reflexes. Her CT scan revealed periventricular hypodensities. On neuropsychological testing, she demonstrated impairments in prospective memory, semantic fluency, and construction, and showed mild impairment in episodic recognition. Her consensus diagnosis was dementia, but the type was unspecified.

Screening Measures. VE's CASI-estimated MMSE score was 21/30 and her estimated 3MS score was 76/100. She lost points on reversal, temporal orientation, sentence repetition, and

interlocking pentagons. On the modified CSI 'D', she had difficulty with short-term memory items, abstract thinking, interlocking pentagons, attention and calculation, and was not oriented to date or year (see Table 1). On the informant section, her daughter endorsed memory changes, some difficulties with complex ADLs, and personality and mood changes. Overall, she showed significant impairment in multiple domains and functional changes, supporting a diagnosis of dementia.

Case 4: JM

Background. JM is an 83-year-old Cree speaking male who was referred from a northern community. He was accompanied to the assessment by his grandson. JM reported a six year history of memory changes, visual hallucinations, and functional impairment. He also reported experiencing dizziness in the context of a recent history of falls. His medical history was positive for mild congestive heart failure and hypothyroidism. His grandson noted a history of multiple deaths in the family and increased social withdrawal by his grandfather. JM completed one year of formal education in a residential school. He worked as a trapper and commercial fisherman through most of his adult life. Although he could comprehend and converse informally in English, his grandson provided translation services.

Assessment Findings. On neurological exam, he had mild rigidity and bradykinesia, more pronounced on the left than the right. His gait was slow and shuffling, and he had a stooped posture and tended to turn en bloc. CT scan revealed moderate generalized cerebral atrophy and small vessel disease. On neuropsychological assessment, he demonstrated moderate impairment in access to his semantic store, complex attention, visuospatial abilities, and in confrontational naming. His consensus diagnosis was dementia with lewy body.

Screening Measures. His CASI-estimated MMSE score was 23/29 (writing not attempted). His CASI-estimated 3MS score was 65/95. He lost points on reversal, recall (no recall of any of the words even with cuing), pentagons, and sentence repetition. On the modified CSI 'D', he had difficulty with recalling three words after a short-delay, calculation, and interlocking pentagons (see Table 1). In contrast, he was fully oriented and had no difficulty with expressive or receptive language functioning. On the informant section (see Table 2), his grandson did not endorse major changes but described a general decline in mental functioning and loss of interest in previously enjoyed activities. Some decline in ability to manage household tasks was noted. Overall, the screening measures showed difficulty with episodic memory, working memory, mental calculation ability, and visuospatial skills, and supported a diagnosis of dementia.

Discussion

The four case studies involved Cree-speaking adults referred from remote Aboriginal communities. All participants had limited formal education which took place in residential school settings and two were not literate. Two of the participants were fully fluent in English; however, family members were present to provide translation as needed and to offer collateral information. All of the participants and their family members reported satisfaction with the assessment procedures and commented on the comfortable interview and assessment process. The screening instruments were helpful in providing data for end-of-day team diagnosis and produced findings that were consistent and supported other neuropsychological and interprofessional team results. The informant sections provided helpful supplementary data and supported the estimates of severity of impairment in all cases except JM's, where his grandson endorsed very few specific cognitive changes.

In comparing our participants' performance to the dementia sample described by Hall et al. (1993; as shown in Tables 1 and 2), there is generally good correspondence on item performance. For example, the highest percentage of participants had difficulty with recall, copying pentagons, and with orientation to date and year in both Hall's dementia sample and our four participants. In contrast, in the current study, the four cases performed better on the language items and particularly on the calculation items, which were sensitive items to cognitive impairment in the Hall et al. sample. In the orientation domain, Hall et al.'s sample also had more difficulty providing the name of the chief, the part of the reserve in which they resided, and the month. Regarding the informant interview section, Hall and colleagues found that 100% of informants of participants with dementia reported changes in ability to perform household tasks, change in activity level, and a change in personality. Ninety-nine percent of the sample rated forgetfulness with where they placed items. However, in our study, only VE's informant rated a personality change and only JM's informant endorsed difficulty performing household tasks. Informants for two of our cases, both diagnosed with dementia, rated a change in activity level. Interestingly, Hall et al. found that the personality change item and depression items were reported significantly more by Cree participants than the majority culture sample. With the exception of VE, who presented with premorbid emotional difficulties, these items were not endorsed across our participants.

Several patterns emerged when examining the CSI'D' and CASI data. First, all cases evidenced difficulty with the pentagons (i.e., copying interlocking five-sided drawings) and no patient had a perfect score on this item. This is consistent with Hall et al.'s (1993) developmental data, which showed that Cree participants performed significantly less well on interlocking

pentagons than English-speaking participants. In that study, there was no statistical correlation between pentagons and education, suggesting a possible cultural bias in the item.

Second, three of the four cases had difficulty with reversal (digits backward) on the CASI. Although possibly reflective of their level of cognitive impairment, the scores may also indicate a possible educational bias for this item. For example, Escobar et al. (1986) found that individuals with a minimal level of formal education experience great difficulty performing subtraction/calculation items. Additionally, Hall et al. (1993) found that the calculation items were performed more poorly by the Cree participants when compared to the English-speaking participants and were significantly correlated with education. For the current study, the participants had completed between one and five years of formal education and most had difficulty with digit reversal. Interestingly FB, who was not diagnosed with dementia, performed normally on reversal and calculation. This is suggestive of accurate assessment of cognitive status; however, given the small sample of four case study participants, it is not possible to rule out an educational bias.

Overall, although these screening measures represent a significant improvement from traditional measures, several limitations remain, including the difficulty with pentagons and mental reversal, and the requirement of literacy for completion of the CASI. Others have addressed the need for screening tools that can be used with individuals who are not literate. For example, Glosser et al. (1993) developed the Cross-Cultural Cognitive Examination (CCCE) to screen non-literate populations. Originally constructed for an NIH neuroepidemiologic study of Guam-Parkinsonism-Dementia-Complex, the CCCE has been demonstrated to be less sensitive to language, education, and social factors and has adequate criterion validity relative to other dementia screening measures. Nevertheless, Glosser and colleagues described culture based

differences in the overall score, and the items that were culturally biased were also the most sensitive to detecting early stage dementia (e.g., verbal memory, fluency, and abstraction). Consequently, eliminating these items would result in an unacceptable low level of sensitivity. Teng (1996) also developed a version of the CASI (version 2.0) for use with a predominantly illiterate Chinese population. Modifications included making the subtraction items more concrete (e.g., calculations with money) and reducing the number of points allocated to reading and writing and giving more weight to naming abilities.

It is also important to note potential limitations in using the harmonization approach to test development. Although this method is generally considered the most appropriate in developing culturally appropriate assessment instruments (e.g., Hendrie, 2006), it remains challenging to determine whether modifications ensure that the items are consistent with the culture, educational norms, and language of the study population and that cultural bias on the instrument will be reduced. This method also assumes that content-related validity will continue to be met (i.e., measurement of the construct intended to be measured). Our modifications to the CSI 'D' and CASI attempted to increase the appropriateness of the instruments with a Cree Speaking population, based on careful review with the Grandmothers, thorough pilot testing through the Rural and Remote Memory Clinic, and review of the instruments by healthcare providers. However, the strength of the assumption that the modifications were consistent with the culture and language of the study population might have been strengthened by expert review with more individuals. The results of these four case studies do, however, suggest that performance on items measuring specific domains (i.e., naming ability) was consistent with performance on other measures of the same ability.

Another observed limitation of these instruments is their limited current practicality in a clinic setting. First, the modified CSI 'D' took up to 40 minutes to complete and did not yield a standardized score or estimated 3MS/MMSE score. Although the CASI allowed for this, it was time-consuming to calculate the CASI-estimated 3MS/MMSE scores and allied health care workers both in our clinic and in Northern sites provided the feedback that the scoring procedures were not straightforward enough for clinical use without modification.

Several limitations of this research need to be mentioned. This series of case studies is based on a small number of participants and thus the generalizability of the findings is limited. Although referrals of Aboriginal seniors are made to the clinic on a regular basis, travel costs and long distances result in a greater proportion of Aboriginal compared to non Aboriginal seniors declining offered appointments. Data are continuing to be collected to enable quantitative analyses in future studies. A second limitation is that the screening results were considered during the end of day team consensus meeting to determine diagnosis. This limits our ability to establish the validity of these screening measures, because the consensus diagnosis was not determined independently, and the traditional neuropsychological instruments were not administered for comparison purposes due to time constraints.

An additional potential limitation is that family members provided translation services and might have provided subtle bias in the translation process. However, family members were clearly instructed to translate both instructions and patient responses without modifying the content or providing coaching or additional support to the patient. Because clinic patients presented from diverse geographical areas, regional dialects necessitated that someone from the same geographical region provided translation services. Additionally, because collateral

information is essential to the assessment process, family members are needed to provide accurate translation and information about the patient's functional abilities.

This study is the first that we are aware of that has modified and evaluated, in a preliminary manner, cross-cultural screening measures for use in a clinic with Canadian Cree-speaking Aboriginal seniors. Use of these instruments resulted in positive rapport with patients and their families and represented a significant improvement from existing assessment measures and interview protocols. Nevertheless, several difficulties remain with using these modified instruments within our clinic and in epidemiological work in northern communities of Saskatchewan. Importantly, literacy and some formal education are required to complete some of the items. Our ongoing work in this area is generating a screening protocol appropriate for individuals who have no formal education or limited exposure to urban culture that incorporates some of the strengths of the CSI'D' (e.g., informant interview) and the CASI (e.g., delayed recall, money calculations) but without the problematic tasks identified through the current research (e.g., pentagons, digit span, repetition, etc.). The challenge remains to develop a screening protocol that is sensitive to early stage cognitive decline, but not biased to individuals with low formal education and little experience with urban culture.

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Table 1. CSI 'D' Cognitive Assessment Items and comparison with Hall et al.'s (1993) sample

					% correct (Hall et al.)	
	GL	FB	VE	JM	No Dementia	Dementia
Domain						
Short-Term Memory						
Remember my name	C	C	C	C	90	40
Recall three words	X	X	X	X	78	20
Abstract Thinking						
Bridge (Table)	C	X	X	X	98	80
Hammer	C	C	X	C	99	60
Church	C	C	C	C	100	80
Language						
Name:						
Pencil	C	C	C	C	99	80
Watch	C	C	C	C	99	80
Chair	C	C	C	C	100	80
Shoes	C	C	C	C	99	80
Knuckles	C	C	C	C	96	40
Elbow	C	C	C	C	98	60
Shoulder	C	C	C	C	99	80
Repeat Phrase*	C	C	C	C	97	80
Name Animals (Raw Total)	8	6	8	9	0.55 *	0.35*
Repeat Boat, House, Fish	C	C	C	C	99	99
Praxis						
Nod Head	X	C	C	C	100	80

Culturally Appropriate Assessment

Point to window then door	X	C	C	C	99	80
3 step command	C	C	C	C	100	80
Construction						
Overlapping Circles	C	C	C	C	91	66
Interlocking Pentagons	X	X	X	X	52	0
Calculation						
\$20 - \$2	C	C	X	C	77	20
Count 1-10	C	C	C	C	99	80
Count Backwards 10-1	X	C	C	C	80	50
Cost of Lard	C	C	C	X	77	0
35 cents as change from \$1	N/A	C	X	C	48	0
Orientation						
Name of reserve	C	C	C	C	98	80
Name of chief	X	C	C	C	72	40
Part of reserve	C	C	C	C	91	40
Who lives next door	X	C	C	C	98	80
Month	C	C	C	C	94	40
Day	X	X	X	C	92	40
Part of day	C	C	C	C	97	80
Season	C	C	C	C	100	80
Year	X	C	X	C	73	20
Did it snow yesterday	C	C	C	C	99	80
Trapping or fish season	C	C	C	C	100	80

Table notes: X = incorrect response, C = correct response; *Hall, et al., (1993) calculated this score by dividing the number of animals reported by a participant by the highest number reported by any member of the group (the number of animals ranged from 2 to 21 for the Cree group)

Table 2. CSI 'D' Informant Interview Items and comparison with Hall et al.'s (1993) sample.

	% Reporting Problem (Hall et al.)					
	GL	FB	VE	JM	No Dementia	Dementia
Domain						
Memory/Cognition						
Remembering is a problem	Y	--	Y	N	33	83
Forgetting where put things	Y	--	Y	N	54	99
Forgetting where things kept	Y	--	Y	N	28	83
Forgets names of friends	Y	--	Y	N	8	67
Forgets names of family members	Y	--	Y	N	6	67
Forgets conversation mid-sentence	Y	--	Y	Y	24	67
Forgets when last saw you	Y	--	Y	N	5	33
Forgets what happened the day before	Y	--	Y	N	14	60
Forgets where he/she is	Y	--	N	N	4	50
Gets lost in the community	N	--	Y	N	2	33
Gets lost in own home	N	--	N	N	1	17
Activities of Daily Living (ADLs)						
Household tasks	N	--	N	Y	17	100
Adjusting to change	Y	--	N	N	21	80
Feeding self	N	--	N	N	0	16
Dressing	N	--	N	N	1	50
Using Toilet	N	--	N	N	0	0
Change in ability to handle money	Y	--	Y	N	11	80
Loss of skill or hobby	N	--	N	N	29	67
Change in ability to think and reason	N	--	N	N	9	83
Miscellaneous						

Culturally Appropriate Assessment

Change in activities	N	--	Y	Y	47	100
Decline in mental functioning	Y	--	Y	Y	25	83
Difficulty finding the right word	Y	--	Y	N	21	67
Uses wrong words	N	--	N	N	19	83
Talk about long ago	Y	--	N	N	82	67
Personality						
Changes in personality	N	--	Y	N	23	100
More irritable	N	--	Y	N	30	67
More stubborn	N	--	Y	N	27	50
Less concern for others	N	--	N	N	5	33
Depression						
Loss of interest in general	N	--	Y	Y	29	83
More depressed than used to be	N	--	Y	N	33	83

RUNNING HEAD: GRASSHOPPERS AND GEESE TEST

Study 3: The Grasshoppers and Geese Test Battery: Development of a Set of
Neuropsychological Tests for Use with Ethnically Diverse Older Adults in a Rural and Remote
Memory Clinic

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Abstract

This research describes the development of the Grasshoppers and Geese Test (G&G), a short battery of measures of memory (episodic recognition, prospective memory) and language functioning (semantic associations, confrontational naming). The test was designed in response to the current lack of appropriate assessment measures for use with culturally diverse older adults. All measures were based on modifications of existing instruments or paradigms, and were developed in consultation with an Aboriginal Grandmothers Group and Northern healthcare providers. Participants included 82 healthy adults of majority culture background who were family members of patients referred to a Rural and Remote Memory Clinic and 39 participants of Cree background who were recruited from remote Northern communities and also urban settings. Clinic participants included a mixed clinical sample, a sample of 44 individuals diagnosed by team consensus with Alzheimer's disease who were compared to an age-equivalent sample of healthy older adults, and a sample of patients diagnosed with semantic dementia. Initial normative data and evaluation of psychometric properties are presented by cultural group, and further stratified by age, sex, level of education, and verbal ability. The measures showed adequate internal consistency, good criterion-related and construct validity, and clearly differentiated the AD sample from healthy older adults. Based on this initial evaluation, the G&G shows good utility for use with older adults residing in rural and remote prairie regions.

Introduction

There is a well-recognized need for culturally relevant neuropsychological tools for the comprehensive clinical assessment of higher brain functions among ethnically diverse older adults (Manly, 2006; Rivera Mindt, Byrd, Saez, & Manly, 2010; Romero et al., 2009).

Neuropsychological assessment has a key role in diagnosis of dementia and it is therefore essential to have reliable and valid tools that are appropriate for ethnically diverse older adults and to have appropriate normative data with these tools (Brickman et al., 2006; Dick, Teng, Kempler, Davis, & Taussig, 2002; Manly, 2006; Wolfe, 2002). Appropriate assessment instruments and normative data are essential for accurate detection of cognitive impairment.

However, there are very few measures that have been validated for use among ethnic minorities (Manly, 2006). This research aimed to address this gap in research and clinical practice by developing a short battery assessing memory and language functions, for use with individuals referred to a Rural and Remote Memory Clinic (Crossley et al., 2008; Morgan et al., 2009).

Referred patients are from diverse cultural backgrounds and reside in rural and remote prairie regions. Patients complete cognitive screening measures and neuropsychological assessment measures. Our goal was to develop a culturally appropriate clinical assessment tool that complements the traditional measures in the battery and that encompasses several aspects of cognition that are relevant to the detection of early stage dementia. Development of our measures involved modifying existing instruments and paradigms for assessing language functions, episodic memory, and prospective memory and extends from previous work examining modified screening measures for culturally appropriate assessment in the clinic (i.e., as described in Study 2, Lanting, Crossley, & Morgan, in review). Based on findings of previous research with Cree-speaking Grandmothers and healthcare providers in remote Northern communities (i.e., as

described in Study 1, Lanting et al., in press), these new components are comprised of colour photo stimuli and familiar images, and have been designed to be engaging and enjoyable.

Individuals of Cree background were our reference group for developing the measures; however, these measures were also developed for, and data collected with, majority culture participants from rural and remote backgrounds.

Semantic Memory

Assessment of semantic memory, a type of long-term memory involving the store of fact and feature based knowledge about the world (Tulving, 1983), is one aspect of a comprehensive neuropsychological assessment. Assessing degradation to semantic memory ability is important because these changes can be a feature of dementia typically reflected in expressive and receptive language difficulties. For example, investigation of semantic memory is particularly important in advancing our current understanding of frontotemporal dementia (FTD), a set of clinical syndromes characterized by progressive language and behavioral dysfunction associated with neuropathology in the anterior temporal and frontal lobes. One subtype of FTD is semantic dementia (Hodges & Patterson, 1997; Hodges, Patterson, Oxbury, & Funnell, 1992; Snowden, 1999), a clinical syndrome characterized by the progressive loss of semantic knowledge (Bozeat, Lambon Ralph, Patterson, Garrard, & Hodges, 2000; Hodges et al., 1992; Rosen, Lengenfelder, & Miller, 2000), with the consequent progressive decline in verbal comprehension during conversation and in expressive language tasks, such as confrontational naming. In addition, patients with semantic dementia typically make semantically-based language errors, such as referring to a rabbit as a dog (Snowden, 1999).

There are few tests of semantic knowledge, and even fewer that use nonverbal responses to assess semantic knowledge when there is significant impairment in expressive language. One

test, the Pyramids and Palm Trees (PPT; Howard & Patterson, 1992), uses line-drawn representations of concrete familiar images to assess nonverbal demonstrations of semantic knowledge. The PPT test requires a participant to access semantic information by examining a series of conceptually related drawings presented in triads. The target picture (e.g., pyramid) is presented above two other drawings and the participant is asked to point to the drawing (e.g., palm tree or pine tree) that is most closely associated with the target picture. The PPT is considered one of the best tests for assessing semantic memory (Rami et al., 2008), but it has been developed for urban European populations and is subject to cultural and geographic biases that limit its usefulness in testing the semantic memory of individuals residing in rural and remote regions of North America. Developing a semantic association test with concept familiarity for individuals in rural and remote regions of North America was considered crucial for accurately assessing semantic impairment in a clinical setting such as the Rural and Remote Memory Clinic. The PPT was particularly appropriate for modification for use with ethnically diverse older adults because it requires minimal expressive language and is based on visual images.

Episodic Recognition Memory

Recognition memory is an important part of episodic memory and is a type of retrieval activity that demonstrates that information was previously encoded into declarative memory. Whereas retrieval refers to that ability to (freely or with cueing) access previously presented information, recognition memory involves making familiarity judgments between presented and previously learned information, usually through a forced-choice paradigm (Lezak, Howieson, & Loring, 2004). That is, recognition tasks usually involve having a participant make a forced-choice decision (e.g., “No, I did not see that object earlier this afternoon.”) based on previously

learned information that can be presented and assessed in either the verbal or visual domain. Recognition tasks are commonly used when clinically assessing delayed memory performance and can be important in differential diagnosis. In Alzheimer's disease, for example, performance does not typically improve with retrieval cues or on recognition tasks when compared to free recall, whereas in dementias affecting the subcortical regions, there is typically a clear benefit from these supported retrieval strategies when compared to the pattern of free recall difficulties, with grossly intact recognition ability (Salmon & Bondi, 2009). In the development of the G&G, recognition memory for visual images presented previously in the semantic association task was tested using simple "yes" or "no" responses to sequentially presented target and lure stimuli. Participants are required to indicate whether or not each image had been viewed previously.

Confrontational Naming

Confrontational naming is an important component of language assessment. Naming ability requires intact semantic and phonological processing (Bowles, 1993), and involves frontal and temporal regions of the brain. Naming difficulty, or anomia, is commonly observed in dementias such as Alzheimer's disease and semantic dementia (Hodges & Patterson, 1995, 1997), but can also be evident, in mild forms, in healthy aging. Tests of confrontational naming provide clinicians with information regarding word retrieval ability and accuracy. The Boston Naming Test (BNT; Kaplan, Goodglass, & Weintraub, 1983) is a common measure of naming ability that requires the participant to provide a verbal label to a pictorial representation of an object (i.e., a black and white line drawing). For the G&G, participants are required to name photographic color images selected to be familiar to individuals dwelling in rural and remote prairie regions.

Prospective Memory

Finally, an event-based measure of prospective memory was included in the G&G. Prospective memory is a complex cognitive process involving at least four stages: (a) intention formation, which is the period during which the future activity is planned; (b) intention retention, the period during which the intention is held in memory while other activities are occurring; (c) intention initiation, the point at which the appropriate cue triggers an eventful and controlled search of memory for the intention; and (d) intention execution, which refers to activation of the retrieval context and execution of the intended action (Ellis, 1996; Kliegel, Martin, McDaniel, & Einstein, 2001). Stated more simply, prospective memory involves noticing *when* to do something and initiating the appropriate action, and is thought to depend on attention and executive functions mediated by the frontal-striatal systems (Burgess, Quayle, & Frith, 2001). A distinction has been made between time- and event-based prospective memory tasks (Kliegel et al., 2001). Time-based tasks require the participant to perform a specified behaviour at a particular time, whereas for event-based tasks, the required behaviour is prompted by an external cue. Although prospective memory complaints are common in individuals diagnosed with pre-clinical dementia, there are relatively few studies investigating prospective memory performance in dementia (Karantzoulis, Troyer, & Rich, 2009). Because prospective memory tasks are complex and are theorized to require an executive component, measuring prospective memory performance is an important component of assessing very early changes in cognitive ability. In the G&G, participants are given increasingly detailed cues that they are to remind the examiner to administer a final set of questions (i.e., a previously planned future event).

Culturally Appropriate Test Development

Guidelines for the development of the G&G were established during a previous study (Lanting et al., in press). In this research, Aboriginal Grandmothers discussed the importance of

culturally grounded assessment approaches and guided the development of the Grasshoppers and Geese to use colour images that included familiar and humorous stimuli that would maximize comfort and encourage informal conversation as part of the assessment process. In generating new triads, discussion of the stimuli with the Aboriginal Grandmothers often evoked stories about the stimuli and their role in Aboriginal culture or the geographical landscape. In pilot testing with the instrument in both healthy older adults and in the Rural and Remote Memory Clinic, the instrument prompted conversation and relaxation in clinic patients who were completing this measure. Due to the gentle nature of the G&G, clinicians in the clinic decided to start and end the assessment with components of this instrument.

Evaluation of Psychometric Properties

Reliability. The concept of reliability refers to the consistency and the relative accuracy with which scores taken from a measuring instrument estimate various attributes of something (Reynolds, 1998). Stated differently, reliability is the consistency in measuring a given test score. Reliability is typically evaluated through assessment of several forms of reliability evidence, including consistency across test item (i.e., internal consistency), consistency across time (i.e., test-retest reliability), and consistency across raters (i.e., interrater reliability). These forms of reliability all contribute to understanding the degree to which measurement error is present. Urbina (2004) defines measurement error as fluctuation in scores that results from the measurement process but that is not related or relevant to what is being measured. When error variance is investigated, results are usually reported in terms of a reliability coefficient, a specific use of a common correlation coefficient. For scores yielded by a test to be appropriately reliable for individual diagnostic applications, its reliability coefficients should approximate or exceed

.80 in magnitude; coefficients of .90 or greater are considered to be the most desirable (Aiken, 2000; Reynolds, Livingstone, & Willson, 2006).

Error associated with content sampling reflects the degree of homogeneity among items within a test and pertains to measurement of internal consistency. Because the purpose of a test is to measure a certain characteristic, ability, or content area, the more closely items relate to each other, the smaller the error in the test will be. Internal consistency refers to the consistency of results across items within a test (Sherman, Slick, Strauss, & Spreen, 2006) and, for the G & G, was measured using split-half reliability. The split-half method avoids many of the theoretical and practical problems in test-retest and alternative forms methods (Reynolds, 1998). First, this method allows reliability to be estimated without administering two different tests or administering the same test twice. There are several ways of splitting a test to estimate reliability: a test can be split into two subtests. Another method is the odd-even split, in which the odd-numbered items form one half of the test and the even-numbered items form the other. Odd-even reliability was investigated in developing the G&G. Because there were easy and difficult items, an odd-even split allowed for even distribution of these items. A subset of odd-numbered items was compared to a subset of even-numbered items (with even distribution of easy and difficult items in both subsets).

Error due to time sampling refers to the extent to which an individual's test performance is constant over time and is usually estimated by the test-retest method (Sherman et al., 2006). Because the normative data collection with each participant took place over one session, test-retest reliability was not assessed.

Validity. According to the Standards for Educational and Psychological Testing of the American Educational Research Association (AERA), American Psychological Association, and

National Council on Measurement in Education (1999) validity refers to “the degree to which evidence and theory support the interpretation of test scores entailed by proposed users of tests” (p. 9). While several models of validity have been proposed, the most common is the tripartite model, which divides measurement of validity into three parts: content-related, criterion-related, and construct validity (Mitrushina, Boone, Razani, & D’Elia, 2005; Nunnally & Bernstein, 1994).

Face validity refers to the extent to which an examinee believes a test measures what it appears to measure (i.e., whether it looks valid) and can affect engagement and motivation towards the test. Face validity is important because it encourages rapport between the examiner and the examinee, as well as openness about test results and their implications (Urbina, 1994). This type of validity was considered integral to the G&G subtests.

Content-related validity evaluates the degree to which the items on a test are representative of a construct that the test was designed to measure (Nunnally & Bernstein, 1994; Sherman et al., 2006). Determinations regarding content-related validity are typically based on whether the test items were generated based on a theoretical model for the construct of interest (e.g., episodic memory) and whether that theoretical model reflects the most current empirical research on that construct (Sherman, 2006). With reference to the G&G, the constructs measured are semantic memory, episodic recognition, confrontational naming, and prospective memory. For the semantic associations tasks, the initial theoretical rationale for the selection of items came from an existing measure. As this is an adaptation of a well validated measure, content validity was assumed to be met. The recognition, confrontational naming, and prospective memory tasks also were derived from well-known and currently accepted paradigms and thus content validity was assumed to be met.

Criterion-related validity refers to whether a test is accurately measuring the construct it was intended to measure, and in particular, how the test compares to other measures that are believed to measure a similar ability (Sherman et al., 2006). In broad terms, criterion-related validity refers to the sensitivity and utility of the task, and the strength of the relationship between the test and another, independent criterion. Two approaches to generating criterion-related validity evidence have been used: concurrent and predictive validity (Nunnally & Bernstein, 1994), which differ in terms of a temporal gradient. For this study, we focused on evaluating concurrent validity by correlating performance to other measures designed to assess the same general ability or domain, as described in Part III. Criterion-related validity was also assessed by evaluating the classification accuracy statistics of the G&G subtests (i.e., Receiver Operating Characteristic plots to assess sensitivity and specificity).

Construct validity refers to the theoretical relationship of a variable to other variables (Nunnally & Bernstein, 1994). Stated differently, it is the examination of how well a test is measuring what we believe it to be measuring. This type of validity often involves two subtypes: convergent and divergent validity. Correlations between the G&G subtests and traditional neuropsychological measures designed to measure the same construct were used to examine convergent and divergent validity.

Clinical Group Validation. Clinical group validation is important for examining whether a neuropsychological test can identify cognitive deficits in various clinical samples and differentiate the samples from a control group. For the clinical sample, the same measures were used to assess criterion-related and construct validity. Performance was also compared with a sample of age-equivalent healthy older adults, as reported in detail in Part III.

Part I: Description of the G&G Test Development

An item pool was generated based on consultation with a group of Aboriginal seniors (i.e., the Grandmothers Group) and community members familiar with or residing in rural Saskatchewan. Triads were selected for their geographic relevance and based on feedback received during focus groups with the Grandmothers (e.g., the importance of incorporating humorous, colorful and visually engaging stimuli), as described in previous work (i.e., Study 1; Lanting et al., in press). Specifically, rich detailed colour images were obtained from Google with permission of the website authors and from personal photographs provided by members of the NET research project. Humour was incorporated when possible into the stimuli; for example, we used an image of a rodeo clown in a humorous pose, an image of a skunk with its tail up, and of a well-fed gopher sitting on its haunches. We also included pleasant images of babies and small children, as recommended by the Grandmothers, and images familiar to prairie dwelling individuals (e.g., images of vegetation, farm equipment, and indigenous animals). In deciding how many items to include in the initial pool, Devellis (2003) suggests that more items should be generated than are planned for inclusion in the final instrument. Consequently, fifty-eight triads were generated for the initial pool and the final pool was anticipated to include approximately 52 triads (i.e., equal to the number of triads comprising the Pyramids and Palm Trees test).

Once the items are generated, Devellis (2003) suggests that the next step should involve having the initial item pool reviewed by experts. This involved triad review by the Grandmothers Group, groups of graduate students, and healthcare providers in rural and remote regions of Saskatchewan. Following expert review, the initial pool was administered to a developmental sample, as described in the following study.

Part II: Developmental Study – G&G Semantic Associations Task

Method

Participants

Healthy Adults

Two age groups of majority culture normal participants, young (18-39 years) and older adults (60-88) were recruited into a normal aging study conducted in conjunction with another graduate student in the Aging Research and Memory Clinic (Patrick Corney). In total, 60 participants were recruited, including 15 young males ($M = 25.7$ yrs, $SD = 4.3$), 15 young females ($M = 28.7$ yrs, $SD = 5.6$), 15 older males ($M = 77.1$ yrs, $SD = 6.9$), and 15 older females ($M = 75.5$ yrs, $SD = 6.7$). There was a significant difference in the average educational level. Specifically, young participants had more years of education ($M = 17.60$ yrs, $SD = 2.6$) than the older participants ($M = 14.33$ yrs, $SD = 3.6$), $F(1,59) = 16.29$, $p < .001$. Importantly, no age differences were found on the Wide Range Achievement Test-Reading subtest (WRAT-3 Reading; Wilkinson, 1993), $F(1,59) = 0.61$, $p = .44$, indicating general equivalency in verbal ability among groups. Additionally, there were no sex differences on the WRAT-3 Reading subtest, $F(1,57) = .95$, $p = .33$.

In addition, the candidate received funding to continue data collection with healthy adults in Aboriginal communities in Northern Saskatchewan. Eight participants (six females) were recruited and completed the measures ($M = 36.6$ yrs of age, $SD = 11.9$). All participants were fluent in English, and several participants spoke additional languages (i.e., Michif Cree, Woodlands Cree). Seven out of the eight participants reported engaging in traditional practices (e.g., eating wild meat, fishing, hunting, trapping, jigging). There were no significant differences

in education between majority culture ($M = 16.0$ yrs, $SD = 3.5$) and Aboriginal adults ($M = 13.9$ yrs, $SD = 2.6$), $F(1,67) = 2.62$, $p = .11$.

Clinic Participants

The G&G semantic associations task was also administered to a developmental sample of 28 clinic patients ($M = 77.5$ yrs, $SD = 8.2$) referred to the Rural and Remote Memory Clinic between October 2004 and August 2005. These participants were from diverse cultural and geographical backgrounds and a range of dementia diagnoses and types of cognitive impairment were included. Initial pilot testing with the G&G immediately identified the high level of acceptability of this instrument for all clinic patients. In particular, the engaging nature of the G&G semantic associations task prompted a new neuropsychological test administration procedure. Specifically, the test was split into two halves, so that clinic patients could begin the assessment with the first half of this engaging task and end the formal neuropsychological testing session with the second half. Based on our initial observations of positive response to the G&G semantic associations among our patients, we concluded that this procedure would maximize test-taking comfort and minimize the experience of negative affect during the testing process. In addition, this new procedure allowed the incorporation of a prospective memory component into the G&G semantic associations task and development of a measure of episodic recognition and confrontational naming.

Procedures

Oral and written informed consent was obtained from participants before proceeding (see Appendices C and D for ethical approval documentation and Appendix E for consent forms). Once consent was established, all participants were asked to complete a questionnaire providing

demographic and health status information. Aboriginal participants were also asked to provide information regarding engagement in cultural practices (see Appendix F).

Materials

Grasshoppers and Geese Semantic Association Test. Fifty-eight triads (two sample triads and then 58 experimental triads; see Appendix G for sample triad) of pictures were presented and participants were asked to identify which of the two pictures on the bottom of the page best matched the target picture at the top.

Results

Following administration of the initial item pool of 58 items to the developmental sample of 30 young and 30 older healthy adults, all items were preliminarily evaluated according to predetermined criteria so that those failing to meet the criteria could be removed from the final measure. This was conducted through item analyses, which focused on descriptive statistics and analysis of systematic biases. Frequencies were generated as the first step in evaluating each triad. Triads for which the valid percent correct for each item was less than 90% were targeted for further analysis. Triads that participants spontaneously criticized for poor clarity or ambiguity of the images were also evaluated for appropriateness. One triad was omitted because the stimuli were difficult to perceive and identify in order to make the correct semantic association. One triad was omitted because participants reported that the target item was ambiguous. Three additional triads were eliminated because they did not meet the 90% correct criterion. Two of these triads also had ambiguous stimuli. Five additional triads that did not meet the correct percent criterion were considered and found to be valid triads for which the images were clear to participants and there were no systematic biases for gender or age. These five triads which did not meet the percent correct criterion were considered to be more difficult triads which would

remain in the final sample. Finally, cross-tabs were used to detect differences in item performance based on gender, age, and cultural background. Fisher's Exact Tests and Mann-Whitney U tests were run to detect significant systematic biases for each item on sex, age, or cultural background. No significant differences in item performance on these variables were found. Ten triads were identified as of medium difficulty (i.e., 90-95% correct) and four items were classified as difficult based on <90% correct. These items were moved to the end of each half, in order to equalize the two halves in terms of difficulty.

Scores were computed for the abbreviated item set. That is, although participants completed 58 experimental triads, scores for the 53 triads which comprised the final sample were extracted and a new percent correct score was generated for the abbreviated item set. Analyses completed with the modified instrument yielded similar comparable normative data to the original Pyramids and Palm Trees test, including a similar average percentage correct score. Specifically, the mean percent correct was 97.3% ($SD = 2.42$) vs. 98-99% on the Pyramids and Palm Trees. Additionally, there were no significant differences using the modified instrument in percent correct scores for culture, sex, or age.

For the clinical sample, the mean percent correct was 85.7 ($SD = 8.1$). As expected, there was a significant difference in performance between the older healthy adults and the clinical sample, $t = 7.45$, $p < .001$.

Part III: Normative Data and Clinical Validation of the G&G

Hypotheses

We hypothesized that the Grasshoppers and Geese measure of semantic associations would yield a similar percent correct score to the Pyramids and Palm Trees for healthy adults, and would differentiate healthy adults from individuals with early stage AD, and individuals with

early stage AD from individuals with semantic dementia. Further, it was hypothesized that there would be no cultural differences in performance on this measure, at least among Western Canadian populations. Similarly, for the episodic memory, confrontational naming, and prospective memory tasks, it was also hypothesized that there would be culturally equivalent performance but that the tasks would be useful in differentiating healthy older adults from a dementia sample. Psychologists working with populations for which tests have not been standardized encounter challenges similar to ours and we hoped that explaining our procedures would provide useful information to others working in this area. We aimed to adapt current test material to be appropriate for Cree-speaking older adults referred from remote regions of Saskatchewan but also more broadly for older adults residing in rural and remote regions of a Prairie province.

We also provide preliminary normative data on the psychometric properties of these instruments in terms of their acceptability, reliability, and validity. Internal consistency reliability was evaluated in this study by evaluating the split-half reliability. We hypothesized that the semantic associations subtest would generate an acceptable odd-even split correlation.

For criterion-related validity, we predicted that, for the semantic associations subtest of the G&G, performance on the subtest would be positively correlated with a general index of language functioning and other measures of language [i.e., Repeatable Battery for the Assessment of Neuropsychological Status (RBANS; Randolph, 1998) Language Index, and the Animal Naming Test (Goodglass & Kaplan, 1983) and the Controlled Oral Word Association Test (FAS; Spreen & Benton, 1977) in the clinical sample]. This was also predicted for the confrontational naming task. For the episodic recognition task, performance was predicted to be correlated with scores on a general measure of delayed memory functioning (i.e., RBANS

Delayed Memory Index). The G&G prospective memory subtest performance was also expected to correlate with an index of delayed memory functioning (i.e., RBANS Delayed Memory Index) as well as measures of executive functioning [i.e., Trails B (Reitan, 1992) and the Stroop Test (Trennery, Crosson, DeBoe, & Leber, 1989)]. Criterion-related validity was also assessed by evaluating the classification accuracy statistics of the G&G subtests (i.e., Receiver Operating Characteristic plots to assess sensitivity and specificity). We predicted that for all of the G&G subtests, the area under the curve (AUC) would be acceptable (i.e., $>.80$; Hanley & MacNeill, 1982).

For construct validity, specifically convergent validity, we hypothesized that performance on the semantic associations subtest would be significantly correlated with measures purported to measure semantic fluency and general fund of information (i.e., RBANS semantic fluency, and WAIS-III Similarities subtest in the clinical sample). For the G&G confrontational naming subtest, we correlated scores with a measure also designed to measure naming ability (i.e., RBANS picture naming) and predicted a significant correlation. For the G&G episodic recognition task, we predicted positive correlation with performance on measures of episodic immediate memory (i.e., RBANS list learning) and episodic delayed memory (i.e., RBANS list recall, RBANS list recognition). For the prospective memory subtest, we expected significant correlations with measures of delayed episodic memory (i.e., RBANS list recall) and with measures of executive functioning (i.e., Trails B and Stroop Test). To assess divergent validity, it was expected that none of the G&G subtests would be significantly correlated with measures of visuospatial ability (i.e., RBANS line orientation), constructional ability (i.e., RBANS figure copy), or with a measure of basic attention (i.e., RBANS digit span).

Method

Participants

This project was funded through a Canadian Institutes of Health Research New Emerging Team (NET) grant, entitled, “Strategies to Improve the Care of Persons with Dementia in Rural and Remote Areas.” The flagship project of the NET involves the development, implementation, and evaluation of a Rural and Remote Memory Clinic (Crossley et al., 2008; Morgan et al., 2009). Clinic participants were recruited through the RRMC. Healthy majority culture participants were recruited in two ways: (1) family members of clinic patients were recruited because these individuals tend to share educational experiences and other sociocultural and demographic characteristics to the clinic patients and therefore offer an appropriate normative group with which to compare the clinic participants; and, (2) through a community organization for older adults. Healthy non-majority culture participants were recruited during Northern fieldwork in the communities of Ile-a-la-Crosse and Buffalo Narrows, SK and an urban sample was recruited through the Westside Community Clinic in Saskatoon. Participants in all groups were of diverse educational backgrounds. We had full ethics review and approval by the Behavioral Research Ethics Board at the University of Saskatchewan (see Appendix C), by the board of directors at the Saskatoon Community Clinic, and through the Keewatin Yatthe Regional Health Authority (see Appendix D for approval from the Keewatin Yatthe Regional Health Authority board members). See Appendix E for the consent form used for Study 3.

Healthy Participants- Majority Culture

Eighty-two healthy majority culture participants were included in this sample. As shown in Table 1, there were 27 females and 55 male participants. Healthy majority culture participants had an average of 13.5 years of education ($SD = 2.8$). On a measure of estimated verbal ability,

the Wide Range Achievement Test-Reading subtest (WRAT-3 Reading; Wilkinson, 1993), the majority culture sample had a mean score of 47.9 ($SD = 5.1$), which falls in the average range.

Healthy Participants – Cree Background

Thirty-nine healthy (12 females and 27 males) individuals of Cree background also participated (see Table 1). These participants were recruited from both urban settings and remote Northern communities. Of the urban sample, ten participants were born in Northern communities and five participants were born in Central rural regions of the province. In terms of self-identified cultural background, all reported their background as Northern Cree, Plain Cree, or Métis. All participants were fluent in English but most participants listed Cree or Michif Cree as an additional language. The mean years of education for Cree participants was 9.0 ($SD = 3.6$). The mean WRAT-3 Reading score for this sample was 41.6 ($SD = 9.5$). This score was significantly lower than for the majority culture sample, $F(1,56) = 12.4$, $p < .001$, and is consistent with Manly's research suggesting that estimates of verbal ability reflect differences in educational quality and experiences rather than an underlying verbal intellectual ability (Manly, 2006; Manly & Echemendia, 2007; Manly, Jacobs, Touradji, Small, & Stern, 2002).

All healthy participants completed a modified alternate screening measure, the Cognitive Abilities Screening Instrument (CASI; Teng et al., 1994) to assess cognitive status. This test was further modified for use with individuals of Cree-background from Northern Saskatchewan, as described in Study 2 (Lanting et al., in review). This modified CASI was used as a culturally appropriate screen for individuals of non-majority culture background. Estimated Mini-Mental State Examination (Folstein et al., 1975) scores can be generated using the CASE, but as the psychometric properties (i.e., ideal cut-off score) are not yet established for this measure, participants were included even if their score was below the traditional MMSE cut-off score. The

mean score for the majority culture sample was 27.8 ($SD = 2.1$) and for the Cree participants, the mean score was 27.3 ($SD = 2.6$). There was no significant difference in performance between cultural groups on the CASI, $F(1,68) = 1.02, p = .32$.

Clinical Participants

Performance was examined in three samples: a mixed clinical sample, an Alzheimer's disease sample, and a sample of participants with semantic dementia, as described below.

A mixed clinical sample ($n = 60$) was included, comprised of patients who had been assessed through the Rural and Remote Memory Clinic. All clinic participants had been assessed and diagnosed through consensus by an interdisciplinary dementia assessment team that includes neurology, neuropsychology, neuroimaging, and physiotherapy. This sample included varied diagnosis (i.e., Alzheimer's disease, vascular dementia, dementia with Lewy body, frontotemporal dementia, normal pressure hydrocephalus, and dementia due to multiple etiologies) and severity/stage of disease. The mean age for the mixed clinical sample was 74.0 ($SD = 9.7$), the mean level of education was 11.1 ($SD = 2.9$), and the mean WRAT score was 41.8 ($SD = 5.9$). In healthy older adults, this score falls in the average range.

A second clinical group included patients diagnosed with Alzheimer's disease (AD; $n = 44$) and was compared to an age-equivalent sample of healthy older adults ($n = 26$). The sample of AD participants included patients diagnosed from the very early stages of the illness to those in the moderate stage of their illness. The subsample consisted of healthy older adults whose mean age was 75.7 ($SD = 8.2$). The mean years of education was 13.6 ($SD = 3.1$) and their mean WRAT score was 47.3 ($SD = 6.5$). Again, all participants were above cut-off on the MMSE ($M = 28.9$; $SD = 1.1$). The mean age for the AD sample was 76.5 ($SD = 7.5$). The mean years of education was 10.4 ($SD = 2.8$) and their mean WRAT score was 41.7 ($SD = 5.5$). The mean

MMSE score for the clinical sample was below cut-off for cognitive impairment ($M = 21.2$; $SD = 4.4$). See Table 10 for demographic data.

We also assessed performance in a small group of six patients diagnosed with semantic dementia (SD), a clinical subtype of frontotemporal dementia (FTD). The mean age for the SD sample was 69.7 ($SD = 12.8$), the mean years of education was 12.8 ($SD = 2.2$), and the mean WRAT score was 39.8 ($SD = 6.3$). This score falls in the average range for healthy older adults.

Materials

As stated above, in addition to the G&G, participants completed tests of estimated verbal ability (WRAT-3 Reading subtest) and current cognitive functioning (CASI) and a questionnaire for demographic information and health status (see Appendix F). The subset of healthy older participants ($n = 26$) and all clinic participants completed the Repeatable Battery for the Assessment of Neuropsychological Status (RBANS; Randolph, 1998), verbal fluency and language measures, and measures of complex attention/executive functioning. These participants and the neuropsychological measures they completed were used to evaluate criterion-related validity and construct validity.

Grasshoppers and Geese Semantic Association subtest. Please see Appendix H for the G&G manual, which provides test instructions and scoring information. Triads (two sample triads and 53 experimental triads; see Appendix G for a sample triad and Appendix I for the 53 item record form) of pictures are presented and for each set, participants are asked to identify which of the two pictures on the bottom of the page best matches the target picture at the top. Each item is scored as correct or incorrect (i.e., 0 or 1). The total score for this subtest is 53 (possible range of 0 to 53). Higher scores are associated with better performance.

Grasshoppers and Geese Episodic Recognition Memory subtest. This task is administered following a brief delay after the first half of the semantic associations portion. It is composed of 30 pictures (10 target items and 20 distracter items) and requires each participant to determine whether an item is the same as one previously viewed (i.e., in the first half of the semantic association portion of the task). See Appendix J for the record form. The target stimuli were chosen from the first half of the semantic associations and contain an equal number of images from the top, bottom left, and bottom right, to prevent or minimize bias of location of the image in the recognition task. Of the 20 distracter items, 9 items are semantically related to the target stimuli (see Table 3). Again, because it is a forced choice measure, each item is scored as 0 or 1. The total score for this subtest is 30, with a range of 0 to 30. A score of 30 equals perfect performance on this measure.

Grasshopper and Geese Confrontational Naming Test. Participants are asked to name 18 colour photo stimuli. These particular images were chosen from the developmental data of the semantic associations task, which identified 6 easy, 6 medium, and 6 difficult images based on the responses of the developmental normative data set. An equal number of items in the first and second halves of the semantic associations task were included in each of the three difficulty gradients in order to minimize any effects of better performance (i.e., labeling correctly) for items already viewed in the first half of the semantic associations task, as items previously viewed may be more easily labeled than items not seen (e.g., a priming effect). A score of 0, 1, or 2 can be obtained for each item. Two points are given when the exact label has been retrieved. Current scoring criteria include a category label cue if a superordinate category label is given (e.g., fruit for an image of strawberries), resulting in a score of 1 instead of 2. Alternatively, a semantic cue is provided if the item is clearly misperceived. If a correct answer is provided after

the cue, there is no penalty (i.e., the score is 2). The total score for this subtest is 36 and scores can range from 0 to 36. Again, higher scores mean better performance on this measure. See Appendix K for the record form and detailed scoring criteria.

Grasshoppers and Geese Prospective Memory Test. At the end of the first half of the semantic associations task, participants are told, "We are going to finish the second half of this test a little later when we have finished all of the other tasks. When you hear me say that we have now completed all of the tests, please remind me that we have the rest of the Grasshoppers and Geese to complete". Scores range from 0 (recall of task after initial cue) to 4 (no recall of task after three consecutive prompts). Higher scores signify poorer performance on this measure. See Appendix H for the manual, outlining test instructions and scoring.

Repeatable Battery for the Assessment of Neuropsychological Status (RBANS; Randolph, 1998). This screening battery was developed for identifying and characterizing cognitive impairment in older adults and consists of five indexes, with component subtests: Immediate Memory (list learning and story memory subtests), Visuospatial/Constructional (figure copy and line orientation), Language (picture naming and semantic fluency), Attention (digit span and coding), and Delayed Memory (list recall, list recognition, story recall, and figure recall). Raw scores and standardized scores are generated, with higher scores signifying better performance. This measure demonstrates good psychometric properties and clinical validity (Randolph, Tierney, Mohr, & Chase, 1998).

Additional neuropsychological measures included the Stroop Test (Trennery et al., 1989), a measure of inhibition of an automatic response, and the Trail Making Test (Reitan, 1992), a measure of cognitive flexibility and sequencing, to measure executive functioning. For assessment of language and verbal fluency, the Controlled Word Association Test (FAS; Spreen

& Benton, 1977), Animal Naming Test (Goodglass & Kaplan, 1983). The Wechsler Adult Intelligence Scale – Third Edition (WAIS-III) Similarities subtest was used in the clinical sample.

Procedure

Oral and written informed consent was obtained from participants before proceeding. Once consent was established, all participants were asked to complete a questionnaire providing demographic and health status information (see Appendix F). Aboriginal participants also were asked to provide information regarding engagement in cultural practices. The questionnaire material required approximately five minutes to complete and the assessment measures required between 30 and 45 minutes to complete.

Results

Item Analyses.

Item analyses for the majority culture sample are presented in Tables 2, 3, and 4. For the semantic associations task (Table 2), performance was above 90% on 46 of the 53 items. Four medium and two difficult items produced scores of below 90%. For the episodic recognition task, there was more variability in performance; however, again most items produced scores of 90% or higher. Seven items resulted in lower scores and four of these were the conceptually related foil items. However, for one target item (i.e., the image of a husky), only 54% of participants were correct. For the confrontational naming task, scores generally corresponded to developmental data on ratings of easy, medium, and difficult items. Percent correct scores for items ranked as easy ranged from 87% - 100%, items ranked as of medium difficulty ranged from 85% - 100%, and scores for items rated as difficult ranged from 64% - 88%.

Demographic Analyses

As shown in Table 1, in addition to expected education differences, there was a significant difference in WRAT-3 scores between majority culture participants and the participants of Cree background. Therefore, normative data are presented separately for the two cultural groups (see Table 5). ANOVAs were run for the G&G measures, with age group (four groups for the majority culture sample and three groups for the Cree sample), educational group (<12 years and 12+years of education), and sex as between group independent variables. In the majority culture group, there were no significant age differences for semantic associations, episodic recognition, or prospective memory; however, there were age differences for the confrontational naming task, $F(1,82) = 3.5, p < .05$. There were no sex differences on any of the G&G measures for majority culture participants. Regarding education, participants with lower education scored significantly lower on episodic recognition, $F(1,81) = 8.5, p < .05$. For the Cree participants, there were no age differences in semantic associations, episodic recognition, or prospective memory; however, there was a marginally significant age difference for confrontational naming, $F(1,39) = 3.1, p = .06$. There were no sex differences on any of the G&G measures for Cree participants. Similarly, there was no main effect of education on the measures for the Cree sample. Due to specific education effects in the majority culture sample, the normative data were further stratified by education and WRAT-3 Reading scores (median split), collapsed across age (see Table 6 and 7). The age range and sample size for the majority culture and Cree participants differed. Because the data was collected by convenience sampling, the overall majority sample was larger and allowed age breakdown into four groups. The sample of Cree participants contained fewer participants and included younger participants, resulting in a breakdown of three age groups. However, all age group breakdowns generally corresponded to conventional normative data age category breakdowns in neuropsychological research (e.g.,

young-middle adults, middle aged adults, and older adults) and did not overlap. As shown in Table 8, the healthy majority culture adult sample was broken into four age groups: young-middle (35-46 years, $n = 14$), old-middle (47-60; $n = 21$), young-old (61-70; $n = 28$); and old-old (75-92; $n = 19$). As shown in Table 9, for the Cree normative sample, participants were broken into three age groups: young-middle (20-39; $n = 16$), middle (40-63; $n = 10$), and older adults (68-81; $n = 13$).

Normative data for G&G subtests

For the majority culture participants, the mean score for the semantic associations test was 97% correct ($M = 51.3$; $SD = 1.6$). For the confrontational naming task, the average score was 33.6 ($SD = 2.6$); that is, 93% correct. An average of .3 category labels were needed ($SD = .7$) and a mean of .7 semantic cues was required ($SD = .9$). On average, healthy participants required less than one semantic cue. For the episodic recognition memory task, the average score was 27.2 ($SD = 2.6$) or 91% correct. For the prospective memory task, the average score was .4 ($SD = .82$), which means participants required less than one cue, on average. Data by education, sex, and WRAT score are presented in Table 6. Data by age group is presented in Table 8.

For the sample of participants of Cree background, the mean score for the semantic associations test was 95% correct ($M = 50.2$; $SD = 2.1$). For the confrontational naming task, the average score was 31.4 ($SD = 3.0$); that is, 87% correct. An average of .08 category labels were needed ($SD = .27$) and a mean of 1.5 semantic cues was required ($SD = 1.0$). For the episodic recognition task, the average score was 26.6 ($SD = 2.6$) or 89% correct. For the prospective memory task, the average score was 1.2 ($SD = 1.0$), which means participants required one cue, on average. Again, data by education, sex, and WRAT score are presented in Table 7. Data by age group is presented in Table 9.

Reliability.

Reliability was calculated for the semantic associations task. The even and odd totals were significantly but not highly correlated ($r = .333, p = .003$). Additionally, although equal numbers of easy and medium/difficult items were placed in the first and second halves of the semantic associations task, the mean scores for the second half of the test were slightly lower than the scores on the first half. For example, for the sample of healthy adults of Cree background, the mean percent correct for the first half was 96% correct and for the second half, the mean percent correct was 94% correct. For the majority culture healthy sample, the first half mean percent correct was 97% and the mean percent correct for the second half was 96%. This is a difference of one item and does not reflect a clinically meaningful difference. A Guttman Split Half Coefficient was conducted and yielded a reliability statistic of .537. However, due to 27 items having zero variance, this statistic was calculated for 26 items. The lack of variance in several items likely explains the relatively low, but significant, correlation between the odd and even totals, as reported above.

Validity

Regarding criterion-related validity, we predicted that the semantic associations task would be correlated with a general measure of language functioning in the healthy older adult sample. However, scores on this subtest were not significantly correlated with the RBANS Language Index. For the G&G confrontation naming task, we hypothesized that performance would also be positively correlated with the RBANS Language Index. The confrontational naming task was marginally positively correlated with the RBANS Language Index ($r = .353; p < .08$). Contrary to our predicted significant correlation between the episodic recognition task and the RBANS Delayed Memory Index, there was no significant correlation. As expected, the

prospective memory task was significantly negatively correlated with RBANS Delayed Memory Index ($r = -.649, p = .001$), meaning that fewer prompts on prospective memory was correlated with higher performance on the Delayed Memory Index; however the prospective memory task was not correlated with measures of executive functioning.

For construct validity, specifically convergent validity, we predicted significant correlations between the G&G subtests and measures designed to measure the same construct. As expected, the semantic associations score was significantly correlated with RBANS semantic fluency ($r = .514, p = .007$). The confrontational naming task was not positively correlated with RBANS picture naming but was significantly correlated with RBANS semantic fluency ($r = .552, p = .003$). The episodic recognition task was not significantly correlated with delayed memory measures (i.e., RBANS list recognition or list recall) but, as predicted, was significantly correlated with an immediate memory task [i.e., RBANS list learning task ($r = .381, p < .002$)]. The prospective memory task was not significantly correlated with delayed memory (i.e., RBANS list recall) or executive functioning measures (i.e., Trails B and Stroop Test). For divergent validity, it was expected that the G&G measures would not be significantly correlated with measures of visuospatial ability and construction or with basic attention. As predicted, the G&G measures were not significantly correlated with a measure of basic attention (i.e., RBANS Digit Span). Similarly, measures of visuospatial (i.e., RBANS Line Orientation) or constructional ability (i.e., RBANS Figure Copy) were not significantly correlated with any of the G&G measures.

Clinical Validation

For the mixed clinical sample, the mean score for semantic associations was 44.3 ($SD = 5.1$), which corresponds with 84% correct. For episodic recognition, the mean score was 22.1

($SD = 4.8$), corresponding to 74% correct. For confrontational naming, the mean score was 27.1 ($SD = 6.1$), which is 75% correct. For prospective memory, the mean score was 3.3 ($SD = 1.1$).

Data for the AD sample is presented in Table 11. For the AD sample, the mean score for semantic associations was 43.1, which corresponds with 81% correct. For episodic recognition, the mean score was 20.8 ($SD = 4.5$), corresponding to 69% correct. For confrontational naming, the mean score was 26.7 ($SD = 6.2$), which is 74% correct. For prospective memory, the mean score was 3.7 ($SD = .67$). That is, participants required an average of more than three prompts following the cue. As expected, there was a significant difference between healthy and AD patients on semantic associations, $F(1,60) = 328.1, p < .001$. Healthy participants, who had an average score of 96% correct ($M = 51.1; SD = 1.6$) performed better on this task than AD participants ($M = 43.2; SD = 5.0$). On the episodic recognition task, there was a significant difference between healthy participants and AD patients, $F(1, 63) = 39.6, p < .001$. As expected, healthy participants ($M = 27.0; SD = 2.4$) had a much higher mean score than AD patients ($M = 20.8; SD = 4.6$). For confrontational naming, there was also a significant difference between healthy and AD participants, $F(1,58) = 19.5, p < .001$. Healthy participants ($M = 32.4; SD = 2.7$) performed better than AD patients ($M = 26.7; SD = 6.1$). Finally, for prospective memory, there was a significant difference between healthy participants and AD patients, $F(1,63) = 223.9, p < .001$. Healthy participants ($M = .6; SD = 1.0$) required significantly fewer prompts than AD patients ($M = 3.7; SD = .7$). Given that healthy older adults required an average of less than one prompt and that 86% of this sample had a score of 0 or 1, it is likely that more than one prompt represents an impairment. Therefore, it is suggested that the cut-off score for this measure is two or higher.

For the small semantic dementia (SD) group, the mean score for semantic associations was 42.0 ($SD = 14.1$), which corresponds with 79% correct. For episodic recognition, the mean score was 26.0 ($SD = 1.4$), corresponding to 87% correct. For confrontational naming, the mean score was very poor for this group [20.0 ($SD = 2.8$)], which is 56% correct. For prospective memory, the mean score was 3.0 ($SD = 0.0$). Participants diagnosed with SD performed more poorly than the mixed clinical sample on semantic associations and especially on confrontational naming, but they performed close to the normal older adult group on the measure of episodic recognition memory.

Clinical Validity Analyses

Regarding criterion validity, the same predictions were made for the mixed clinical sample as for the healthy sample. As expected, the semantic associations task was positively correlated with the RBANS Language Index ($r = .628, p < .001$) and fluency measures [FAS ($r = .468, p < .001$); Animal naming ($r = .563, p < .001$)]. The confrontational naming task was positively correlated with the RBANS Language Index ($r = .640; p < .001$) and fluency measures [FAS ($r = .426, p < .001$); Animal Naming ($r = .536, p < .001$)]. As predicted, the episodic recognition task was correlated with delayed memory performance [i.e., RBANS Delayed Memory Index ($r = .468, p < .001$)]. Similarly, the prospective memory task was negatively correlated with delayed memory performance [i.e., RBANS Delayed Memory Index ($r = -.349, p < .001$)]. It was also correlated, although less strongly, with measures of executive functioning [Stroop Test ($r = -.272, p = .008$); Trails B ($r = -.228; p = .04$)].

In the mixed clinical sample, for construct validity (convergent validity), the semantic associations subtest was significantly correlated with RBANS semantic fluency ($r = .514, p = .007$) and WAIS-III Similarities ($r = .629, p < .001$), as expected. The confrontational naming task

was positively correlated with RBANS picture naming ($r = .464, p < .001$). The episodic recognition task was positively correlated with delayed memory measures [i.e., RBANS list recognition ($r = .465, p < .001$) and list recall ($r = .313, p < .001$)]. As predicted, the prospective memory task was negatively correlated with RBANS list recall ($r = -.434, p < .001$), Trails B ($r = -.228, p = .04$), and the Stroop Test ($r = -.272, p = .008$). For divergent validity, it was expected that the G&G measures would not be significantly correlated with measures of visuospatial ability and construction or with basic attention. As predicted, the digit span subtest of the RBANS was not significantly correlated with any of the G&G measures. However, the line orientation and figure copy subtests of the RBANS were significantly correlated with the semantic associations task ($r = .400, p < .001$; $r = .453, p < .001$), the confrontational naming task ($r = .264, p < .05$; $r = .289, p < .05$), and the episodic recognition task ($r = .412, p < .001$; $r = .432, p < .001$). The prospective memory task was not significantly correlated with the RBANS visuospatial/constructional tasks.

Sensitivity and Specificity

Receiver Operating Characteristic (ROC) plots were created to determine the sensitivity and specificity of each G&G subtest at a range of cutoff points using the AD sample and the sample of healthy older adults. The area under a receiver operating curve (ROC) is a measure of effectiveness of discrimination (Hanley & MacNeill, 1982). An area of 1.0 represents perfect discrimination and an area of 0.5 corresponds to discrimination that is no better than chance. Sensitivity refers to the proportion of AD patients correctly classified as having the disease while specificity refers to the proportion of healthy older adults accurately classified as not having AD. ROC plots show the sensitivity by 100 minus specificity over all possible cutoff points. The ROC curves for semantic associations, confrontational naming, and episodic recognition are

displayed in Figure 1. Examination of the curves shows that semantic associations was a very accurate predictor of group membership, with an area under the curve (AUC) of 0.956. The episodic recognition task had an AUC of 0.832 and the confrontational naming task had an AUC of 0.875. For semantic associations, a cutoff score of 93% correct corresponded to 86% sensitivity and 91% specificity. For the confrontational naming task, a cutoff score of 88% yielded a sensitivity of 80% and a sensitivity of 77%. For episodic recognition a cutoff score of 85% yielded a sensitivity of 86% and a sensitivity of 76%. Finally, on prospective memory, a cutoff score of two resulted in 85% sensitivity and 93% specificity.

Receiver Operating Characteristic (ROC) plots were also created to determine the sensitivity and specificity of the RBANS subtests (i.e., list learning, picture naming, semantic fluency, list recall, and list recognition) that were included in the construct validity analyses, at a range of cutoff points using the AD sample and the subsample of healthy older adults ($n=26$), and ROC plots were created for the G&G subtests for this reduced older adult sample. All AUCs were acceptable for the RBANS subtests. For the subsample of healthy older adults, the AUC for the G&G confrontational naming subtest decreased (i.e., .875 to .777), likely as a result of the decreased sample size and reduced age variability. Examination of the AUCs shows comparable data for both the G&G subtests and the RBANS subtests. See Tables 12 and 13 for AUC statistics, optimal cutoffs, and associated sensitivity/specificity percentages for the RBANS and G&G subtests. Due to small sample size, statistical comparison between the RBANS and G&G were not conducted.

Qualitative Comments

In addition to quantitative data obtained on the G&G battery, qualitative observations of this measure by clinicians in the Rural and Remote Memory Clinic provides preliminary

evidence of the user-friendliness and acceptability of this measure for clinical patients. The measure was often described as pleasant and frequently prompted spontaneous positive conversation with the examiner and a means of developing rapport with anxious or apprehensive patients. As described above, this resulted in a decision to structure the assessment such that the semantic associations task would both start and end the assessment process. With existing neuropsychological assessment instruments, pleasure and comfort are not typically reported during the assessment process and this battery provides one example of an attempt to increase the level of comfort of older adults during formal assessment. Overall, this qualitative data provided compelling evidence for the face validity of the G&G subtests.

Discussion

Following development of the G&G (Lanting et al., in press), normative data were collected with a sample of healthy participants (of majority culture and Cree background), and with a clinical sample, and it was examined for its utility as an assessment measure in a Rural and Remote Memory Clinic. Based on the aims of this study to address the stated need for measures that are appropriate for older adults of ethnically and geographically diverse backgrounds, we designed the measure for and collected normative data with individuals residing in rural and remote prairie regions and included a sample of individuals of Cree background residing in remote Northern communities or urban settings but who were originally from remote communities. The G&G was quickly identified by patients as a “gentle”, well-accepted set of measures and showed acceptable face validity. Although the semantic associations task was the initially developed task, the other measures were developed subsequently based on the popularity of the test stimuli with research and clinical participants.

All measures of this battery demonstrated good criterion-related and convergent validity in the clinical sample. Specifically, the G&G semantic associations and confrontational naming subtests correlated well with other measure of language and existing measures of verbal fluency and naming ability. Scores on the episodic recognition and prospective memory tasks corresponded well to performance on delayed memory performance and the prospective memory subtest was also correlated with one measure of executive functioning. Moreover, the G&G measures differentiated healthy participants from patients who had been diagnosed with AD and showed comparable sensitivity and specificity to the RBANS subtests. Interestingly, three of the G&G subtests were positively correlated with measures of visuospatial and constructional ability (i.e., RBANS Figure Copy and Line Orientation), contrary to the hypotheses that these measures would not be correlated and would support divergent validity of the G&G. This significant correlation may be due to the high intercorrelations among neuropsychological assessment measures, particularly when samples are adequate in size. For the healthy older adult sample, the semantic associations task yielded adequate construct validity and the confrontational naming and prospective memory tasks showed adequate criterion-related validity. All G&G measures showed good divergent validity in the healthy sample (i.e., they were generally not correlated with measures of basic attention and visuospatial/constructional ability). The small sample size likely accounted for the lack of significant correlations on three of the four G&G subtests for criterion-related and construct validity. Additionally, healthy participants performed very well on this measure and there was limited variability in performance; therefore, this may have affected the strength of correlations that were calculated. For the healthy sample, the semantic associations test demonstrated adequate, although not high odd-even split reliability. This is possibly related to differential difficulty of items included in the odd and even sample. However,

it is more likely that because most items were rated as correct, reliability was reduced due to low item variability. Further, although the test was designed to have equal numbers of easy, and medium/difficult items, healthy participants had lower mean scores on the second half of the test when compared to the first half. Using split-half reliability, with items with zero variance removed, the internal consistency was adequate. Of note, in evaluating the psychometric properties of the Pyramids and Palm Trees Test (PPT; Klein & Buchanan, 2009), results indicated that the PPT achieved poor test–retest reliability, failed to obtain adequate internal consistency, demonstrated poor convergent validity, but showed acceptable discriminant validity. Similarly, the G&G semantic associations task demonstrated good convergent validity but only adequate internal consistency.

Interestingly, in the healthy and clinical sample, the prospective memory task was more highly correlated with episodic memory measures than measures of executive functioning. This has been a finding of previous research; some measures of prospective memory appear to rely more heavily on immediate and delayed memory functions than executive functions (Karantzoulis et al., 2009).

The G&G was designed to be appropriate for individuals from diverse cultural, geographical, and educational backgrounds. For both majority and Cree normative samples, there were specific main effects for age, and a main effect of education for majority culture participants on the episodic recognition task. Cultural background did predict performance on some of the subtests and there were significant differences in education and WRAT reading scores between the two cultural groups. In the Cree sample, the WRAT-3 Reading score was taken as a measure of familiarity with urban culture, acculturation, and English language proficiency, rather than a measure of intellectual functioning, consistent with the

recommendations of Manly and colleagues (Manly & Echemendia, 2007; Manly et al., 1999; Manly, 2006). These differences also underscore the utility of providing separate norms for each cultural group and by other demographic variables.

Regarding performance by clinical group, it was predicted that the semantic associations task and confrontational naming task would be sensitive to frontotemporal dementia, semantic subtype. The sample size for this clinical subgroup was small but interestingly, the mean percent correct scores for the G&G measures were strikingly higher for FTD participants than the AD sample in the episodic recognition task (i.e., 87% vs 69%) but much lower on the confrontational naming task (56% vs 74%). Although severity of illness was not controlled for in these samples and the small sample size of the semantic dementia group determines the preliminary nature of these findings, nevertheless, these results support other findings of intact episodic memory skills in the early stages of semantic dementia.

Future research examining the reliability and validity on all of the measures with both a larger normative and clinical sample is important. Additionally, examining performance on the G&G by diagnosis will provide information on the differential diagnostic utility of this measure.

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Table 1. Demographic Data for the Majority Culture and Cree Normative Samples.

Variable	Majority Culture Sample (<i>n</i> = 82)	Cree Sample (<i>n</i> = 39)
Age (years)	Mean = 62.7 (SD = 14.2)	Mean = 49.2 (SD = 17.1)**
Education (years)	Mean = 13.5 (SD = 2.8)	Mean = 9.0 (SD = 3.6)**
Sex (M:F)	67%/33%	69%/31%
MMSE Converted (<i>n</i> =72) ^a	Mean = 27.8 (SD = 2.1)	Mean = 27.3 (SD = 2.6)
WRAT-3 Reading Score ^b	Mean = 47.9 (SD = 5.1)	Mean = 41.6 (SD = 9.4)**

Table notes: MMSE Converted = Cognitive Abilities Screening Instrument – Mini-Mental State Exam estimated score); WRAT-III Reading Score = Wide Range Achievement Test – Third Edition – Reading Subtest; ** $p < .001$. ^aThe CASI is scores out of a total of 30. ^bThe WRAT-III reading subtest is scores of 57.

Table 2. Semantic Associations Cumulative Percentage Correct (Majority Culture Sample).

GG	C%	GG	C%
Item		Item	
1E	100.0	28E	100.0
2E	100.0	29E	100.0
3E	100.0	30E	100.0
4E	100.0	31E	100.0
5E	100.0	32E	98.8
6E	100.0	33E	98.8
7E	100.0	34E	100.0
8E	100.0	35E	91.3
9E	100.0	36E	100.0
10E	98.8	37E	100.0
11E	100.0	38E	100.0
12E	98.8	39E	98.8
13E	100.0	40E	100.0
14E	100.0	41E	93.8
15E	93.9	42E	100.0
16E	100.0	43E	90.0
17E	98.8	44E	97.5
18E	97.6	45E	100.0
19E	100.0	46M	70.0
20E	100.0	47M	100.0
21M	97.6	48M	100.0
22M	98.8	49M	87.5
23M	90.2	50M	100.0
24M	76.8	51M	88.8
25H	95.1	52H	86.3
26H	100.0	53E	100.0
27H	78.0		

Table notes: E=easy; M=medium; H=difficult

Table 3. Episodic Recognition Cumulative Percentage Correct by Item (Majority Culture Sample).

GG	%C	GG	C%
Item		Item	
1	93.8	16	98.8
2	91.4	17	97.5
3	96.3	18	93.8
4	64.2	19	100.0
5	95.1	20	93.8
6	91.4	21	77.8
7	77.8	22	95.1
8	91.4	23	97.5
9	100.0	24	64.2
10	97.5	25	95.1
11	82.7	26	93.8
12	97.5	27	100.0
13	98.8	28	98.8
14	95.1	29	54.3
15	71.6	30	100.0

Table notes: Items 2,5,7,11,12, 16, 18, 22, 25, and 29 are the target items. Items 4,6 ,13,15,16,20,21, 24, and 26 are the related distracters and were hypothesized to be more difficult because they are conceptually related foils.

Table 4. Confrontational Naming Cumulative Percentage Correct (Majority Culture Sample).

GG	%
Item	
1-E	86.6
2-E	100.0
3-E	98.8
4-E	100.0
5-E	98.8
6-E	98.8
7-M	98.8
8-M	89.0
9-M	85.4
10-M	100.0
11-M	100.0
12-M	98.8
13-H	84.1
14-H	78.0
15-H	87.8
16-H	87.8
17-H	87.8
18-H	64.5

Table notes: E=easy, M=medium; H=Difficult

Culturally Appropriate Assessment

Table 5. Normative Data for the Grasshoppers and & Geese Test Battery (G&G; $N = 121$).

Test	Majority Culture Sample ($n = 82$)	Cree Sample ($n = 39$)
Semantic Associations Total Score ^a	Mean = 51.3 (SD = 1.6); Range = 45-53	Mean = 50.2 (SD = 2.1); Range = 45-53
Episodic Recognition Total Score ^b	Mean = 27.2 (SD = 1.8); Range = 20-30	Mean = 26.6 (SD = 2.6); Range = 20-30
Confrontational Naming Total Score ^c	Mean = 33.6 (SD = 2.5); Range = 24-36	Mean = 31.4 (SD = 3.0); Range = 23-36
Confrontational Naming Category Labels ^d	Mean = .34 (SD = .65); Range = 0-3	Mean = .08 (SD = .27); Range = 0-1
Confrontational Naming Semantic Cues ^e	Mean = .75 (SD = .88); Range = 0-4	Mean = 1.5 (SD = 1.0); Range = 0-3
Prospective Memory Total Score ^f	Mean = .41 (SD = .82); Range = 0-3	Mean = 1.2 (SD = 1.0); Range = 0-3

Table notes: ^aSemantic associations is scored out of a total of 53. ^bThe episodic recognition score is out of a total of 30. ^cThe confrontational naming score is out of a total of 36. ^dConfrontational naming category labels can be provided once for each item for a total of 18 points. ^eA confrontational naming semantic cues can be given for each item, for a total of 18 cues. ^fProspective memory is scored from 0 to 4, with 4 equaling worst performance.

Culturally Appropriate Assessment

Table 6. Normative Data for Majority Culture Sample ($n = 82$) Presented by Level of Education, Sex, and Estimate of Verbal Ability (WRAT-3 Reading).

	Level Of Education		Sex		WRAT Reading	
	<12 years	12+ years	Male	Female	>48	48+
Grasshoppers and Geese Test	($n = 15$)	($n = 67$)	($n = 55$)	($n = 27$)	($n = 37$)	($n = 45$)
Semantic Associations	50.9(2.3)	51.4 (1.4)	51.3 (3.9)	51.2 (1.6)	50.2 (1.5)	51.3(1.7)
Confrontational Naming	33.3 (2.8)	33.7(2.5)	34.0 (2.1)	32.7 (3.2)	33.7 (2.4)	33.6 (2.7)
Episodic Recognition	26.5 (1.7)	27.3 (1.8)	27.2 (1.3)	27.3 (2.5)	26.7 (2.0)	27.5 (1.5)
Prospective Memory	1.1 (1.3)	.23 (.53)	.45 (.94)	.35 (.56)	.64 (1.0)	.21 (.57)

Culturally Appropriate Assessment

Table 7. Normative Data for Cree Sample ($n = 39$) Presented by Level of Education, Sex, and Estimate of Verbal Ability (WRAT-3 Reading).

	Level Of Education		Sex		WRAT Reading	
	<12 years	12+ years	Male	Female	>48	48+
	($n = 26$)	($n = 13$)	($n = 27$)	($n = 12$)	($n = 17$)	($n = 17$)
Grasshoppers and Geese Test	$M (SD)$	$M (SD)$	$M (SD)$	$M (SD)$	$M (SD)$	$M (SD)$
Semantic Associations	49.7 (2.2)	51.3 (1.2)	50.6 (1.9)	49.1 (2.2)	49.5 (2.5)	50.9 (1.2)
Confrontational Naming	30.9 (3.0)	32.5 (2.6)	31.6 (3.1)	31.1 (2.8)	30.4 (3.2)	32.4 (2.4)
Episodic Recognition	26.0 (2.8)	27.9 (1.6)	26.6 (2.5)	26.6 (2.9)	25.5 (3.0)	27.2 (2.2)
Prospective Memory	1.4 (.96)	.7 (1.1)	1.1 (1.1)	1.4 (.89)	1.3 (1.1)	1.2 (1.1)

Table 8. Normative Data for the Majority Culture Sample by Age Group - Young-middle (35-46 years), Old-middle (47-60 years), Young-old (61-75 years), and Old-old (75-92 years).

	Age Group			
	Young- Middle	Old- Middle	Young-Old	Old-Old
	(<i>n</i> = 14)	(<i>n</i> = 21)	(<i>n</i> = 28)	(<i>n</i> = 19)
	<i>M</i> (<i>SD</i>)	<i>M</i> (<i>SD</i>)	<i>M</i> (<i>SD</i>)	<i>M</i> (<i>SD</i>)
Grasshoppers and Geese Test				
Semantic Associations	51.7 (1.2)	51.6 (1.2)	51.4 (1.9)	50.4 (1.4)
Confrontational Naming	35.6 (.76)	34.6 (1.5)	32.9 (2.8)	32.1 (2.7)
Episodic Recognition	27.1(1.4)	27.6 (1.0)	26.9 (2.1)	27.1 (2.0)
Prospective Memory	.14 (.36)	.20 (.41)	.54 (.99)	.73 (1.1)

Table 9. Normative Data for the Cree Sample By Age Group - Young-middle (20-39), Middle (40-63), and Older adult (68-81).

	Age Group		
	Young-Middle	Middle	Old
	(<i>n</i> = 16)	(<i>n</i> = 10)	(<i>n</i> = 13)
Grasshoppers and Geese Test	<i>M</i> (<i>SD</i>)	<i>M</i> (<i>SD</i>)	<i>M</i> (<i>SD</i>)
Semantic Associations	50.7 (1.6)	49.6 (2.3)	50.0 (2.5)
Confrontational Naming	32.8 (1.6)	31.2 (3.5)	30.0 (3.4)
Episodic Recognition	26.9 (2.7)	26.4 (2.2)	26.5 (2.9)
Prospective Memory	.57 (.85)	1.6 (.97)	1.7 (.91)

Table 10. Demographic Data for the Normative Sample of Older Adults ($n = 26$) and the Clinical Sample of Alzheimer's Disease Patients (AD; $n = 44$).

Variable	Normative Sample	AD Sample
	<i>M (SD)</i>	<i>M (SD)</i>
Age (years)	75.77 (8.2)	76.5 (7.5)
Education (years)	13.6 (3.1)	10.3 (2.8)
MMSE Score	28.9 (1.1)	21.2 (4.4)
WRAT-III Reading Score	47.3 (6.5)	41.7 (5.5)

Table notes: MMSE = Mini-Mental State Exam (scored out of 30); WRAT-III Reading Score = Wide Range Achievement Test – Third Edition – Reading Subtest

Culturally Appropriate Assessment

Table 11. Grasshoppers and Geese Data – Healthy Older Adult ($n = 26$) and an Alzheimer's Disease (AD) Sample ($n = 44$).

Test	Normative Data (Raw)	AD Data (Raw)
Semantic Associations Total Score	Mean = 51.1 (SD = 1.6); Range = 48-53	Mean = 43.1 (SD = 5.0); Range = 31-50
Episodic Recognition Total Score	Mean = 27.0 (SD = 2.4); Range = 20-32	Mean = 20.8 (SD = 4.5); Range = 10-29
Confrontational Naming Total Score	Mean = 32.3 (SD = 2.7); Range = 26-36	Mean = 26.7 (SD = 6.2); Range = 12-36
Prospective Memory Total Score	Mean = .57 (SD = 1.0); Range = 0-3	Mean = 3.7 (SD = .67); Range = 1-4

Table 12. Area under the Curve (AUC) Statistics, Optimal Cutoffs, and Sensitivity/Specificity Values Associated With Those Cutoffs for the Repeatable Battery for the Assessment of Neuropsychological Status (RBANS) in the Healthy Older Adult ($n = 26$) and an Alzheimer's Disease Sample ($n = 44$).

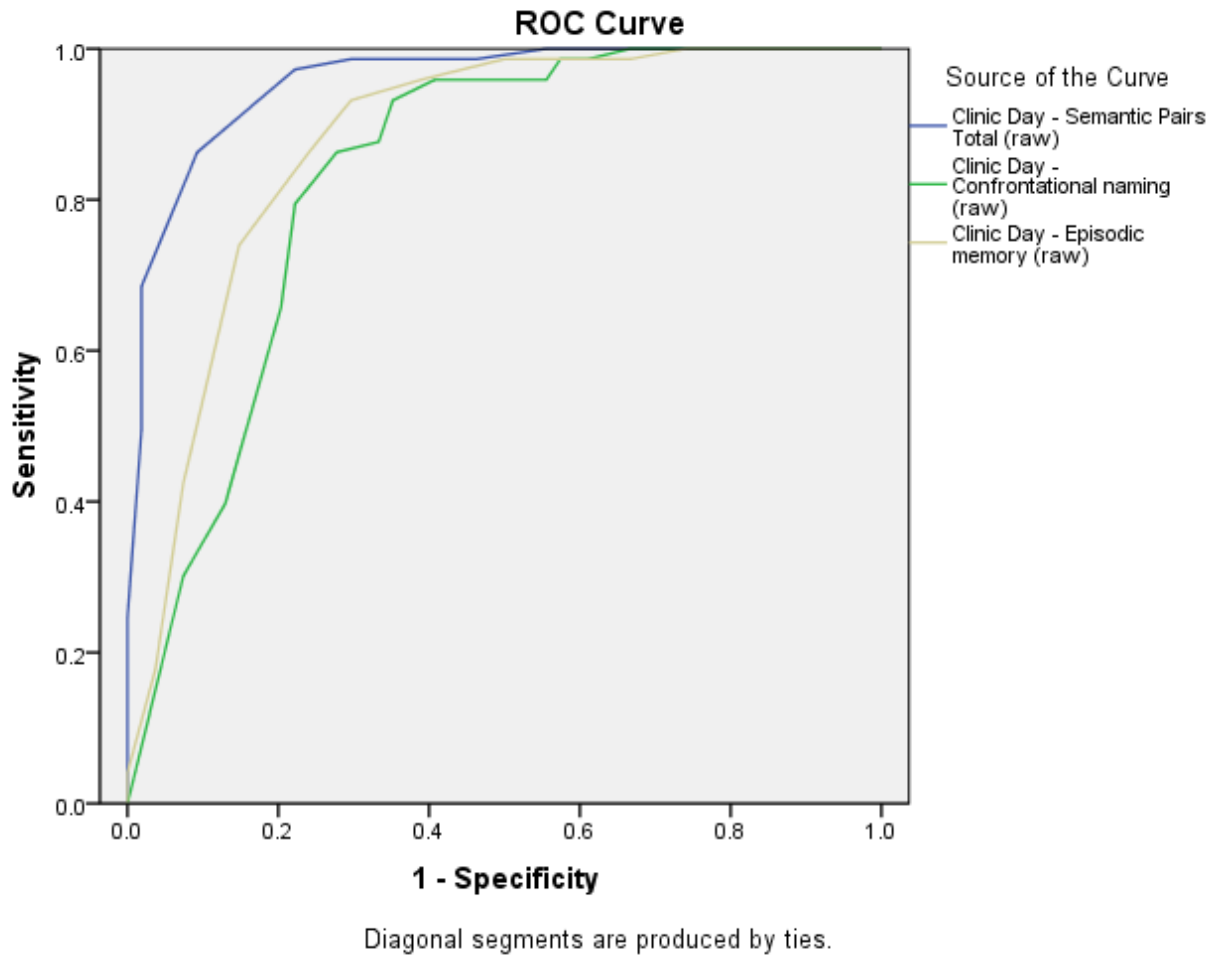
RBANS subtest	Optimal Cutoff			
	AUC	(raw score)	Sensitivity (%)	Specificity (%)
List Learning	0.927	22	94%	81%
Picture Naming	0.888	9	85%	85%
Semantic Fluency	0.886	18	85%	70%
List Recall	0.937	9	100%	96%
List Recognition	0.911	18	87%	77%

Culturally Appropriate Assessment

Table 13. Area under the Curve (AUC) Statistics, Optimal Cutoffs, and Sensitivity/Specificity Values Associated With Those Cutoffs for the Grasshoppers and Geese (G&G) subtests in the Healthy Older Adult ($n = 26$) and an Alzheimer's Disease Sample ($n = 44$).

G&G Subtest	Optimal Cutoff			
	AUC	(raw score)	Sensitivity (%)	Specificity (%)
Semantic Associations	0.969	49	91%	81%
Confrontational Naming	0.777	32	73%	73%
Episodic Recognition	0.91	26	91%	81%
Prospective Memory	0.982	2	94%	91%

Figure 1. ROC plots for G&G Semantic Associations, Confrontational Naming, and Episodic Memory Subtests



RUNNING HEAD: CULTURE AND COGNITIVE AGING

Study 4: Investigating cultural effects on cognitive performance: Normative data with young-middle and older adults of Cree background and majority culture from remote and urban backgrounds

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Margaret Crossley

Debra Morgan

Abstract

The field of neuropsychology increasingly acknowledges that assessment with culturally and ethnically diverse individuals is an area of critical importance in the theoretical and empirical neuropsychological literature (Manly, 2008). Given the increased recognition of cultural heterogeneity among older adults, understanding test performance and aging among diverse seniors is of emergent importance. Although extant cognitive neuropsychological research suggests differences in some cognitive processes when comparing Caucasian Americans and Asian, African American, and Hispanic cultural groups (e.g., Hedden et al., 2002; Park & Gutchess, 2002), and age-related declines in some cognitive processes have been well documented for the majority cultures (e.g., Craik & Salthouse, 2007), methodological limitations have posed a challenge for investigations of cultural influences on cognitive aging (Glymour, Weuve, & Chen, 2008; Pedraza & Mungas, 2008) and little information is available about cross-cultural analogs to models of age-related decline. This study describes normative performance on a modified set of neuropsychological tests with young-middle and older adults of Cree background, compared to an age equivalent group of Caucasian participants from rural or remote regions of Saskatchewan. Based on previous research (Lanting et al., in press), some of the assessment measures were developed to increase appropriateness and acceptability for culturally and linguistically diverse older adults residing in rural and remote regions. Most of the predicted age effects were supported by the data. Although no cultural differences were predicted, Cree participants' mean scores were lower on measures of confrontational naming, semantic memory, verbal fluency, prospective memory, and processing speed, and were presumed to be in keeping with the

significantly fewer years of education, lower estimated reading ability, and well-documented health disparities in the participants of Cree background. These normative data provide some guidance for neuropsychological assessment with middle-aged and older adults of Cree background.

Introduction

The effect of cultural experience on mental processes has been recognized for almost a century. Even in the 1930s, Vygotsky and Luria conceptualized cognition as a product of the interaction among biological, socioeconomic, and cultural factors (Puente & Agranovich, 2003). However, the concept of universalism has been the dominant theory of North American neuropsychology and has not taken into account the role of cultural variables in performance on standardized neuropsychological assessment instruments (Nell, 2000; Perez-Arce, 1999). Instead, neuropsychological practice has primarily decontextualized the brain as “an organ whose processes proceed independent of fundamental socioenvironmental variables” (Perez-Arce, 1999, p. 582). However, emerging research shows cultural influences on cognitive skills and abilities throughout adulthood (Ardila, 2005; Baird, Ford, & Podell, 2007; Brickman et al., 2006; Manly, 2008; Rivera Mindt et al., 2010; Romero et al., 2009). This research has demonstrated repeatedly that individuals from different ethnic groups often perform differently on standard intellectual and neuropsychological tests.

Several factors have been proposed to explain differences in performance on neuropsychological tests in members of different cultural and ethnic groups. These variables include test-taking familiarity, quality of educational experiences, and socioeconomic status. The construct of race or ethnicity has been suggested as most valuable in serving as a relatively accessible proxy for more meaningful but complex variables, such as quality of education, reading level, and health status (Brickman et al., 2006). Manly points out the importance of deconstructing race and ethnicity based on these factors and that emphasizing “the effects of cultural experience on behavior,

attitudes, and other health outcomes reduces the importance of racial classifications and highlights the distinctiveness and depth of culture” (Manly, 2006, p.10). However, models of how brain-behaviour interactions apply in different cultural contexts and patterns of cognitive aging across cultural groups remain poorly understood. Additionally, there is a limitation in available normative data with individuals from diverse cultural backgrounds.

One critically important condition for cross-cultural research in cognition is that tasks are available that permit accurate measurements of equivalent cognitive processes in participants from two cultures (Hedden et al., 2002). Cole (1996) argues that cognitive tests are inevitably cultural devices that assess abilities valued by the culture wherein the test was developed. Accordingly, construct validity cannot be assumed when using existing measures with culturally diverse individuals. The current study addressed this challenge by using modified neuropsychological instruments for increased construct validity based on previous research (Lanting et al., in review; Lanting et al., in press).

Despite the current confounds in measuring cultural influences on cognition, some research groups have examined the effects of culture on cognition in young and older adults in East Asian and Western cultures. East Asians are thought to process information in a more holistic, contextual manner; this is contrasted with the Western tradition of personal agency resulting in more feature-based analytic and categorical cognitive processing (Masuda & Nisbett, 2001; Nisbett et al., 2001). In a sample comparing Chinese adults and American adults, Hedden et al. (2002) reported no cultural differences on speed of processing and working memory tasks that involved visuospatial processing. However, cultural differences emerged on tasks where numerical stimuli

were used; furthermore, cultural differences observed in young adults were attenuated in the older age group. Although it might be hypothesized that age would magnify the effects of culture on cognitive processes, Park, Nisbett, and Hedden, (1999) proposed a model in which the degree to which tasks are demanding of cognitive resources (e.g., processing speed and working memory) mediates cultural differences in performance and age-related decline. According to this model, on “culture-invariant” tasks (e.g., speeded finger tapping), young adults of different cultures will perform similarly and age-related decline will occur in both cultures at an equivalent rate. In contrast, on tasks for which there are cultural differences in performance but are not based on effortful, strategic cognitive processes (e.g., semantic memory), cultural differences evident in young adults will show magnified cultural differences with age, presumably due to the sustained impact of the environment and learning (Park & Gutchess, 2002, p. 860). However, for tasks that are both culturally saturated *and* demanding of cognitive resources, convergence of performance will occur in late adulthood. That is, although young adults show cultural differences on these tasks, older adults across the two cultures will perform with greater similarity due to an age-associated decline in cognitive flexibility for resource demanding tasks. This was found by Hedden et al. (2002); young Chinese participants performed better on digits backward (i.e., working memory) than young American participants, but performance converged with age. Park et al. (1999) postulated that, under process-intensive conditions (i.e., when task demands are high), brain-based declines associated with aging may impose constraints on the ability to apply strategies and knowledge structures specified by culture.

Research investigating cultural differences in cognition and the interaction between culture and age on cognitive processes has focused on East Asian and American populations. There is emerging research on the role of culture on cognitive aging in African American populations (Manly & Echemendia, 2007; Manly, Jacobs et al., 1998). In contrast, there is very little research with Aboriginal populations, and, in particular, Canadian Aboriginal populations. There is some evidence that Aboriginal populations also employ different cognitive styles than their Western counterparts. In particular, Tafoya (1982) argued that Native Americans' reasoning processes tend to be more global or holistic and less of a linear-sequential-analytical reasoning process. Further, Tafoya (1982) and Tharp (1994) posited that learning styles of Aboriginal populations differ from European Americans. Despite preliminary theorizing about the impact of culture on cognitive function in Aboriginal populations, no research to date has examined the interaction of age and culture on the cognitive functions of Aboriginal adults in comparison to majority culture populations. Indeed, there is a paucity of neuropsychological research and normative data collection, in general, with Aboriginal Canadians, although it is well-known that Aboriginal individuals have lower scores on most traditional intellectual assessment measures. For example, First Nations children have lower average IQ scores than their dominant-culture counterparts (Suzuki & Valencia, 1997). Sampling limitations and the striking diversity among tribal groups that make up the First Nations population of North America have prevented the generalizability of the limited extant research examining the social, cultural, and linguistic factors that influence test performance.

The present study explored the effect of culture-specific factors on neuropsychological performance of individuals who self-identified as Cree or Métis (of Cree ancestry), compared to adults of European descent, and provided preliminary normative data from a sample of middle-aged and older Aboriginal adults. In this study, we focused on self-identified ethnicity and performance on both traditional neuropsychological measures and other tests modified or developed to increase the cultural relevance of the assessment. The choice of the two cultural groups was based on clinical need in a Rural and Remote Memory Clinic (Morgan et al., 2009; Morgan et al., 2010). The Rural and Remote Memory Clinic is the flagship project of a Canadian Institutes of Health Research New Emerging Team (NET) grant, entitled “Strategies to Improve the Care of Persons with Dementia in Rural and Remote Areas.” The clinic involves a one-day, streamlined interprofessional assessment in Saskatoon, the urban centre of the region, and pre-clinic assessment and follow-up using telehealth videoconferencing. Referrals to the clinic include Aboriginal older adults from remote reserves and communities, including from Cree communities, necessitating a culturally appropriate dementia assessment service that is tailored to the specific needs of ethnic minority groups with cognitive impairment. Therefore, we wanted to measure performance on neuropsychological instruments in a sample of younger and older individuals of Cree background. To examine cultural differences in cognitive aging between Aboriginal and majority culture adults, we compared performance on tests of speed of processing, executive functioning, attention, and memory abilities. Because there is little theory or data to inform hypotheses, we predicted that most included tasks would not show cultural differences, and similarly, we predicted that age effects would

show parallel patterns between Aboriginal participants and majority culture participants. Specific hypotheses for each domain of cognitive functioning are presented below.

Speed of processing. We predicted equivalent performance between the two cultural groups. Research has demonstrated that there are no cultural differences in speed of processing tasks when comparing East Asian populations to American populations (Hedden et al., 2002). Age differences were hypothesized, such that performance for both Aboriginal and majority culture older adults would be lower than younger adults. This hypothesis was based on well-documented age-related declines in speed of processing and executive functions for majority culture participants (e.g., Craik & Salthouse, 2007; Park et al., 2002).

Divided Attention. We predicted that divided attention tasks would show culture invariance, but age differences were hypothesized for the complex divided attention motor task. This hypothesis was based on a strong body of research using divided attention methodology that demonstrates that speeded motor tasks are slowed more by difficult than easy cognitive tasks, and that difficult tasks have a disproportionately disruptive effect on the concurrent performance of older adults, presumably due to the resource demanding aspect of the difficult condition (e.g., Crossley & Hiscock, 1992; Crossley, Hiscock, & Foreman, 2003; Corney, 2008).

Prospective memory. Age differences but not cultural differences were hypothesized for prospective memory. The age-related hypothesis was based on previous research demonstrating an age effect on prospective memory tasks (Craik & Jennings, 1992; Kidder, Park, Hertzog, & Morrell, 1997; Jager & Kliegal, 2008).

Episodic Recognition. Previous research has not consistently demonstrated age differences in performance on recognition memory tasks (Park et al., 1999). Consequently, no age or cultural differences were hypothesized for the recognition task (total score), although rates of false recognition of categorically related distracters might differentiate Aboriginal and majority culture participants. Park et al. (1999) reported that American participants tend to be more likely than East Asian participants to falsely recognize categorically related distracters when compared to distracters unrelated to target items. Thus, young majority culture participants were predicted to demonstrate a response bias that is greater than for young Aboriginal participants. Based on Park et al.'s (1999) model, it was hypothesized that any cultural differences detected will be larger for the older age groups.

Language Functioning. No cultural differences in confrontational naming were predicted, although younger adults were hypothesized to name items more accurately than older individuals in both cultural groups. This hypothesis was based on previous findings that normal aging negatively affects naming ability (Tsang & Lee, 2003) and that lexical retrieval declines with age (Connor, Spiro, Obler, & Albert, 2004). We predicted age differences on speeded verbal fluency (i.e., animal naming), such that older adults compared to the young participants would produce fewer exemplars during the timed trials. This hypothesis was based on a consistent body of research showing age effects on measures of speeded retrieval from the semantic store of knowledge (e.g., Lanting, Haugrud, & Crossley, 2009; Haugrud, Lanting, & Crossley, 2010). No cultural differences were predicted in terms of the number of exemplars produced during timed semantic fluency trials.

Semantic Memory. We hypothesized that the capacity to make correct associations among items in semantic memory will remain stable across age and between cultural groups. To our knowledge, no research has examined cross-cultural performance on measures of semantic memory.

Method

Participants

As summarized in Table 1, thirty-two majority culture and 30 participants of Cree or Métis background were recruited into the current study. Each cultural group was divided into young-middle age and older age groups. The majority culture participant sample was comprised of healthy family members who accompanied clinic patients for the baseline clinic assessment through the Rural and Remote Memory Clinic. The participants of Cree background were recruited from the Westside Community Clinic in Saskatoon and from the Northern villages of Buffalo Narrows and Ile-a-la-Crosse. Researchers traveled to these Northern villages to collect data with participants; they spent several weeks over the course of three years immersed in the communities to form partnerships in the community, to gain trust, and to identify the volunteers who participated in the current study. We had full ethics review and approval at the university level, by the board of directors at the Saskatoon Community Clinic, and through the Keewatin Yatthe Regional Health Authority. Please see Appendices D and M for ethics approval notices and Appendix L for the consent form.

Two categorical age groups were generated: 30 young-middle aged adults (35-48 yrs, $M = 40.7$ yrs, $SD = 4.6$) and 32 older adults (55-81 yrs, $M = 68.1$ yrs, $SD = 6.4$). The average age of the 15 individuals in the young-middle majority culture sample was 41.7

years ($SD = 4.6$) and for the 17 individuals in the older group, the average age was 68.1 ($SD = 6.8$). For the Cree background sample, the average age of the 15 young-middle participants was 39.7 ($SD = 4.5$) and the average age of the 15 individuals in the older adult sample was 68.2 ($SD = 6.2$). There were no significant differences in mean age for the majority culture and Cree background groups. There were unequal numbers of males and females in both samples (i.e., 75% of the majority culture sample was female and 67% of the Cree background sample was female). Because of the small and unequal sample sizes and since preliminary analyses revealed that there were no significant differences between males and females in either cultural or age groups, sex was not included as a between group variable.

For the majority culture group, all participants listed their preferred language as English. Twenty-eight participants learned English as a first language. Although four participants listed another language as their first language (two French, one Polish and one Ukrainian), all were fluent in English since the age of six or younger. In terms of residential history, two participants listed their current residence as Saskatoon; all other participants listed rural regions as current places of residence and 30 participants were born in rural regions, often in the same communities in which they currently reside. In terms of cultural self-identification, all identified as Caucasian Canadians of European descent.

For the Cree background participant group, 25 of 30 participants reported that at least one of their preferred languages was English; six of these participants also indicated that Cree was an equally preferred language. Four participants reported their preferred language as Cree. Twenty participants listed their first language as Cree and one as

Salteaux. Seven participants listed their first language as English, and two participants indicated that they were raised speaking both English and Cree. Twenty-one participants reported actively engaging in traditional cultural practices (e.g., eating wild meat, fishing, hunting, trapping, jigging). Fifteen participants were born in Northern communities and 15 participants were born in Central rural regions of the province. Fourteen currently live in Saskatoon; one lives in rural Saskatchewan and 15 live in remote communities in Northern Saskatchewan. In terms of self-identified cultural background, 4 reported their background as Northern Cree, 8 as Plains Cree, and 18 identified as Métis.

The average years of education for the four groups are presented in Table 1. A 2 (Age Group) X 2 (Cultural Group) Analysis of Variance (ANOVA) revealed a significant main effect for Cultural Group, $F(1,61) = 40.6, p < .001$, and a main effect for age group, $F(1,61) = 5.5, p = .023$, but no Age Group by Cultural Group interaction, $p = .89$. The majority culture group described an average of 13.5 years of education ($SD = 2.8$ yrs), whereas the average years of education for the Cree background cultural group was 8.5 years ($SD = 3.7$ yrs). Younger adults had an average of 12.0 years of education ($SD = 4.1$) while older adults had an average of 10.3 years of education ($SD = 4.1$).

Procedure

Once consent was obtained, participants were asked to complete an oral questionnaire about geographical background, health status, languages spoken, cultural practices, and cultural identification in order to obtain basic descriptive information about the “cultural location” of participants (see Appendix H). The oral questionnaire required approximately five minutes to complete. Participants then completed the neuropsychological test battery comprised of the instruments described below. The time

taken to complete this battery was approximately 45 minutes. All data was collected in English, as all participants were at least fluent in English.

Materials

Cognitive Screen. The Cognitive Abilities Screening Instrument (CASI; Teng et al., 1994) is a modification of the Mini-Mental State Examination (MMSE; Folstein, Folstein, & McHugh, 1975) and the Hasegawa Dementia Screening Scale (see Teng et al., 1994 for test reference) and has been translated into Chinese, Japanese, and Spanish. The CASI consists of 25 test items and takes approximately 15-20 minutes to administer. It was chosen as the most appropriate screen of cognitive status because it has addressed some of the cultural and educational biases of traditional screening measures but still provides an estimated MMSE score. Additionally, it has been adapted for use with Cree speaking populations (Lanting et al., in review).

Estimate of Verbal Ability. The Wide Range Achievement Test-Reading subtest (WRAT-3 Reading; Wilkinson, 1993) is one of the most frequently used measures of verbal academic achievement and involves letter and word recognition. It provides an estimate of verbal ability. This measure was included in addition to obtaining participants' level of schooling because several studies have shown that reading level has the highest correlation with performance on verbal and nonverbal tests, outranking years of education (Manly et al., 2004; Manly et al., 1999; Manly et al., 2002).

Processing Speed. The Wechsler Adult Intelligence Scale III - Symbol Search subtest (WAIS-III; Wechsler, 1997) is a measure of visual information processing speed. This test is comprised of a series of paired groups, each pair consisting of a target group

and a search group. The participant indicates, by marking the appropriate box, whether either target symbol appears in the search group.

Motor Speed. Finger Tapping Test (FFT). The finger tapping test is a measure of motor speed in the index finger of each hand (Strauss, Sherman, & Spreen, 2006). Single-key finger tapping rates in timed trials of 15 seconds, included as part of the divided attention task, were used to assess basic motor speed with the dominant hand.

Divided Attention. Performance on resource demanding tasks was assessed using dual-task procedures to measure divided attention. Participants were asked to press a key on a finger tapper as quickly as possible. The counting task required participants to start at a given number and count out loud in both easy (counting forward by 1's) and difficult (counting backward by 2's) task conditions. After participants performed each task individually, they were asked to perform the tasks simultaneously for two trials in the easy condition and two trials in the difficult condition. Finally, participants were once again asked to perform each of the tasks individually. Each of the trials in this task was timed for 15 s. The interference effects, as measured by the mean differences in performance from the single to the dual-task conditions were assessed for each participant.

Semantic Memory and Fluency. Semantic memory was assessed using the Semantic Association subtest of the G&G (Lanting, Crossley, & Morgan, 2007). See Appendices H and I for scoring manual and response form. For the semantic association task, 55 triads (two sample triads and 53 experimental triads) of pictures were presented and participants were asked to identify which of two related pictures on the bottom of the page was the best match to the target picture at the top. The total score is 53. Semantic

fluency was measured by Animal Naming (AN; Spreen & Strauss, 1998). For the semantic fluency task, participants were asked to quickly name different animal names within 60 s trials. One point is given for each correct word generated within the 60 s trial.

Episodic Memory. Episodic Recognition subtest of the Grasshoppers and Geese Test. This task was administered following a brief delay after the first half of the semantic association portion of the G&G. The Episodic Recognition Memory Test is comprised of 30 pictures (10 targets items and 20 distracter items) and requires each participant to determine whether or not an item is the same as one previously viewed (i.e., in the first half of the semantic association portion of the task). There are 9 semantically related distracters. The target stimuli were chosen from the first half of the semantic associations triads and contain an equal number of images from the top, bottom left, and bottom right, to control for response bias to location of the image in the recognition task. Each item is one point, resulting in a total score of 30 points.

Prospective Memory. Grasshoppers and Geese-Prospective Memory Test. At the end of the first half of the G&G, participants were told, "We are going to finish the second half of this test a little later when we have finished all of the other tasks. When you hear me say that we have now completed all of the tests, please remind me that we have the rest of the Grasshoppers and Geese to complete." Scores range from 0 (no prompts needed) to 4 (no recall even with maximum number of prompts).

Confrontational Naming. Grasshoppers and Geese-Confrontational Naming Test. Participants were asked to name 18 colour photo stimuli. The images were chosen from the test development data, which identified six easy, six medium, and six difficult to name images based on the responses to the normative data set. A score of 0, 1, or 2 can

be obtained for each item. Two points are given when the exact label has been retrieved. Current scoring criteria include a prompt if a superordinate category label is given (e.g., fruit for an image of strawberries). The total score for this measure is 36.

Design

For the original research design, Analyses of Variance (ANOVA) was conducted with Age Group (young middle-aged and older adults) and Cultural Group (majority culture and Cree background culture) as between group independent variables. A preliminary analysis was run using ANCOVA, with WRAT scores as a covariate, to control for the significant differences in education and WRAT scores between the two cultural groups. There were no differences in results between the two analyses and since the differences in WRAT were presumed to reflect important cultural differences, the original ANOVA results are presented below. For each analysis, age (middle-aged and older) and culture (Cree background and majority culture) were the between-group variables, and for the dual task data, task complexity was a within-subjects repeated variable.

Results

Cognitive Screen

The CASI-generated MMSE mean score for all participants was 28.3 ($SD = 1.7$). We accepted a cut-off score of 23 or above as indicative of normal cognitive functioning, given that the screen was an estimated MMSE. All participants, with the exception of two Cree background older adults fell above the cut-off score (i.e., 23 to 30). These two participants produced scores of 19 and 22, but were included in subsequent analyses because our research with the CASI (see Study 2) suggested that this revised instrument

remains culturally biased and consequently disadvantages individuals who have little formal education or literacy skills. Additionally, the decision to retain these two participants was reinforced because there were no significant differences between these participants and the larger participant group for neuropsychological results. A 2 (age group) and 2 (cultural group) ANOVA produced no significant main effects or interactions between age group and cultural group. Overall, there was no significant difference in mean score on the CASI between the majority and Cree background culture groups, $p = .29$, or between young middle-aged and older age groups, $p = .25$.

Estimate of Verbal Ability

Overall, the mean score on the WRAT-3 Reading subtest was 44.4 ($SD = 7.8$). For healthy adults, this score falls in the average range of performance. As summarized in Table 1, ANOVA revealed a significant main effect for cultural group, $F(1,56) = 12.4$, $p = .001$, $\eta^2_p = .18$, but no significant main effect for age group, $F(1,56) = 14.1$, $p = .60$, and no significant age group X cultural group interaction, $F(1,56) = 1.3$, $p = .26$. In keeping with previously described differences in years of education, the average score on the WRAT-3 Reading subtest for the majority culture group was significantly higher than the average score for the Cree background culture group.

Speed of processing & Motor Speed. It was hypothesized that there would be no differences in performance between the two cultural groups but that older adults would perform more slowly on measures of speed of processing than the young-middle aged adults. In contrast to predictions, the 2 (age group) X 2 (cultural group) ANOVA on Symbol Search scores revealed a main effect for cultural group, $F(1,54) = 20.3$, $p < .001$, $\eta^2_p = .27$, as well as the predicted main effect for age group, $F(1,54) = 46.7$, $p < .001$, $\eta^2_p =$

.46. As shown in Table 3, majority culture participants had higher scores on average than Cree background adults, and as shown in Table 2, young-middle adults had higher mean scores on this measure than older adults regardless of cultural group. Analyses did not reveal a significant interaction between age group and cultural group, $F(1,54) = .00, p = .98$.

For finger tapping, there were only seven older Cree participants who completed the task. We still ran a 2 (age group) X 2 (cultural group) ANOVA, which did not reveal a significant main effect for either cultural group, $F(1,40) = .03, p = .83$ or age group, $F(1,40) = 2.6, p = .10$, and there was no cultural group by age group interaction, $F(1,40) = .09, p = .80$.

Divided attention. It was hypothesized that the divided attention tasks would show culture invariance. However, based on previous research, an age group X task difficulty interaction was hypothesized for the divided attention decrement score. Specifically, it was predicted that there would be a main effect of task complexity on the finger tapping decrement scores and that the mean decrement score for finger tapping on the complex divided attention task would be greater for older adults than young-middle adults.

Because there were no significant age differences in finger tapping rate, we decided that raw difference scores (i.e., single task tapping rate minus dual-task tapping rate) could be used instead of typically used decrement scores. However, again there were only seven older Cree participants who completed the measure. We still ran a 2 (task complexity) X 2 (age group) X 2 (cultural group) ANOVA. There was a main effect for task complexity, $F(1,23) = 12.4, p < .01$, such that performance was better for the simple divided attention task when compared to the difficult task. However, there was no significant main effect

for either cultural group, $F(1,23) = 3.4, p = .82$, or age group, $F(1,23) = 2.6, p = .40$.

Similarly, there was no significant interactions for task complexity, $F(1,23) = .02, p = .24$.

Prospective memory. Age differences but no cultural differences were hypothesized for this measure. There was a significant main effect of cultural group for the prospective memory task, $F(1,52) = 18.7, p < .001, \eta^2_p = .27$ (see Table 3). Participants of Cree background needed more cues for the task than majority culture participants. As shown in Table 2, there was also a significant age effect, $F(1,52) = 8.9, p = .004, \eta^2_p = .15$, such that young-middle adults needed fewer cues than older adults. There was no significant interaction between age Group and cultural Group, $F(1,52) = .36, p < .55$.

Episodic Recognition. No age differences were hypothesized for the recognition task (total score). On the 2 (age group) X 2 (cultural group) ANOVA, there was no significant main effect of age group, $F(1,58) = .01, p = .94$ (see Table 2). No differences in total score were predicted for cultural group and there was no main effect of cultural group, $F(1,58) = .60, p = .44$. Similarly, there was no interaction between age group and cultural group, $F(1,58) = .72, p = .40$. The rate of false recognition of categorically related distracters was hypothesized as a potential differentiator between Aboriginal and majority culture participants. Park et al. (1999) reported that American participants tend to be more likely than East Asian participants to falsely recognize categorically related distracters when compared to distracters unrelated to target items. Thus, young-middle-aged majority culture participants may demonstrate a response bias that is greater than for young Aboriginal participants. In addition it was hypothesized that any cultural

differences detected in the younger age group would magnify with age. These hypotheses were not supported in the results. There was no significant effect of cultural group on performance on items which were categorically related distracters, $F(1,56) = .17, p = .67$ (see Table 3). Similarly, there was no main effect of age group, $F(1,56) = .70, p = .41$. Additionally, there was no significant interaction between age group and cultural group on performance, $F(1,56) = .94, p = .34$.

Confrontational naming task. No cultural differences in confrontational naming were predicted, although younger adults are hypothesized to name items more accurately than older individuals. This hypothesis is based on previous findings that normal aging negatively affects naming ability (Tsang & Lee, 2003) and that lexical retrieval declines with age (Connor, Spiro, Obler, & Albert, 2004). On the 2 (age group) X 2 (cultural group) ANOVA, a main effect of age on performance was found, $F(1,58) = 12.7, p = .001, \eta^2_p = .18$ (see Table 2). Older adults had a lower average score on this measure than young-middle adults. There was also a significant main effect of cultural group, $F(1,58) = 22.6, p < .01, \eta^2_p = .28$ (see Table 3). Majority culture participants had a higher mean score on the measure than the Cree background participants. The interaction between age group and cultural group was not significant, $F(1,58) = 1.0, p = .31$.

Semantic Fluency (i.e., G&G - semantic association component and Animal Naming). For the semantic fluency measure (i.e., animal naming), it was predicted that age differences would be found for this measure, such that older adults would perform more poorly on this task. On the 2 X 2 ANOVA, there was a significant effect of age group, $F(1,54) = 4.4, p = .04, \eta^2_p = .08$ (see Table 2). Similarly, there was a main effect of cultural group, $F(1,54) = 21.0, p < .001, \eta^2_p = .28$. Majority culture participants generated

a higher mean number of words than participants of Cree background. There was no significant interaction between age group and cultural group, $F(1,54) = .84, p = .36$.

Semantic Memory. It was hypothesized that the capacity to make correct associations among items in the semantic store of knowledge would remain stable across age and cultural groups. On the 2 (age group) X 2 (cultural group) ANOVA, there was no significant main effect for age group, $F(1,53) = 2.2, p = .142$. However, there was a main effect of cultural group, $F(1,53)=5.7, p = .02, = \eta^2_p = .09$, where Cree participants performed more poorly on the measure (see Tables 2 and 3). Subsequent analyses showed equivalent performance on the first half of the test for both age and culture, but cultural differences on the second half. The interaction between age group and cultural group was non-significant, $F(1,53) = 1.5, p = .70$.

Discussion

This study provides data on neuropsychological test performance in a sample of young-middle and older adults of Cree background, residing in both urban and remote communities of Saskatchewan. These participants were compared to samples of age-equivalent Caucasian individuals residing in rural or remote regions of Saskatchewan in order to investigate cultural differences in cognitive aging. Predicted age differences were seen in favour of younger adults for measures of confrontational naming, prospective memory, verbal fluency, and processing speed. There were no age differences in semantic associations ability, simple motor speed, or episodic recognition memory. Regarding cultural differences, the majority culture sample had higher mean scores on the measure of ability to form associations among items in the semantic store, confrontational naming, prospective memory, verbal fluency, and processing speed.

There were no cultural differences in basic motor speed or on a task of divided attention. Although the measures of semantic store, naming, and prospective memory were modified for use with culturally and linguistically diverse older adults, there were still cultural differences in performance. The sample size for the Cree sample was very small and there was considerable variability in the finger tapping data for both majority culture and Cree participants. Although a main effect for task complexity was found, there was no effect of age group or an age group by task complexity interaction, as has been found in previous research (e.g., Corney, 2009; Crossley & Hiscock, 1992; Crossley, Hiscock, & Foreman, 2003).

Interestingly, there were no significant interactions between cultural group and age group in the current study in contrast to our hypotheses based on work by Park and her colleagues (Park et al., 1999; Park & Gutchess, 2002). Park's body of research suggests that on tasks where there are cultural effects, cultural differences will magnify with age if a task is non effortful but will converge with age on tasks that are effortful. For tasks that showed cultural differences, there were no interactions with age group, suggesting similar aging trajectories across the cultural groups on cognitive functioning.

The two cultural groups differed on several important demographic variables, including education, reading level, first language, and geographical background. Although these differences accurately reflect the demographics of the communities sampled and would be similar to older adults being referred to the Rural and Remote Memory Clinic for assessment, these differences limit the interpretation of the effects of "culture" on cognitive test performance. Rather, as Brickman et al. (2006) suggest,

cultural group is arguably an important proxy variable for other factors that could account for discrepancies in test performance.

The current study included participants with very little formal education, which addresses a limitation of previous research. When people with education equal to or less than 8 years of education are combined as a single “low education” group, which is conventional practice, individuals with no or few years of schooling, including a higher percentage of older individuals, females, rural residents, and ethnic minorities tend to score at the low end of the norm and are more likely to be considered impaired (Liu et al., 1994; Teng & Manly, 2005). Therefore, test norms are insufficiently adjusted for education at the low end of the education range. Thus, collecting data with individuals with little formal education begins to address the limitations of current normative samples.

Several limitations of this study must be mentioned. First, these data are based on a relatively small sample of participants. It took three years of data collection in Northern communities in order to obtain the number of participants. Establishing partnerships in the communities and gaining trust of community members to participate in a project on neuropsychological test performance was challenging among individuals whose beliefs about assessment were associated with negative consequences or memories (e.g., of residential school attendance). This represents a significant challenge to conducting research with Northern communities in Saskatchewan. Secondly, a significant portion of the older Cree sample found the dual task to be onerous and requested that the test be discontinued; therefore, an even smaller sample completed this task limiting the interpretation of the statistical analyses conducted on these data. A related limitation is

the truncated difference between the average age for the young-middle and older age groups. Due to the limited sample size and sample characteristics (e.g., high number of middle aged participants), the average age difference between the two age groups was 27 years. The age effects seen in previous studies for dual task performance that were not replicated in the current study may be a function both of the reduced difference in age between the groups and the small sample size in the older Aboriginal group.

This research represents a preliminary step in collecting normative data on neuropsychological measures with individuals of Cree background and in gaining an understanding of the pattern of cognitive aging in Cree adults, when compared to adults of Caucasian European background. The patterns of cognitive aging in this study were not consistent with Park's body of research showing either age-related magnification or attenuation of cultural differences in cognitive performance depending on resource demands of a particular task. Demographic variables such as educational experience and reading level differed across cultural groups and may have accounted for cultural differences in performance on certain neuropsychological measures, in keeping with Manly's work. Additionally, the possible role of stereotype threat on performance in Cree speaking participants is not clearly understood and may have influenced performance on the measures. Differences in health status between the majority culture and Cree participants may have also accounted for cultural differences on measures of processing speed and prospective memory. For example, Wilson, Rosenberg, Abonyi, and Lovelace (2010) found that Aboriginal adults over 55 years of age had poorer health than the non-Aboriginal population and reported a greater number of chronic health conditions. Poorer health status may result in an accelerated aging process and lower performance on

measures sensitive to aging, such as processing speed. In our sample, Cree participants were more likely to report a chronic health condition than majority culture participants, consistent with this recent research. Future research more closely assessing health status is needed in order to clarify the possible effects of health status on the differences in cognitive aging.

Overall, the demographics and health status of the Cree participants were representative of the clinical referrals to the Rural and Remote Memory Clinic and underscore the continued need to collect normative data with individuals from diverse cultural backgrounds, including those with little formal education in order for appropriate normative comparisons to be made. The challenges in our data collection highlighted the practical challenges of cross-cultural research in clinical neuropsychology and the need for continued research in this area.

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Table 1. Age, gender, years of education, cognitive screen results, and average neuropsychological test scores (SD) for Age and Cultural Groups.

Variable	Group			
	Young- Mid	Young-Mid	Older	Older
	MC	Cree	MC	Cree
	<i>n</i> = 15	<i>n</i> = 15	<i>n</i> = 17	<i>n</i> = 15
	<i>M</i> (<i>SD</i>)	<i>M</i> (<i>SD</i>)	<i>M</i> (<i>SD</i>)	<i>M</i> (<i>SD</i>)
Age	41.7 (4.6)	39.7 (4.5)	68.1 (6.8)	68.2 (6.2)
Females	12	12	12	8
Schooling (Yrs)	14.5 (2.2)	9.5 (4.1)	12.7 (3.0)	7.5 (3.1)*
WRAT-3 ^a	48.1 (5.2)	39.5 (7.0)	46.9 (4.9)	42.5 (10.8)*
CASI ^b	28.3 (1.7)	27.5 (2.0)	27.4 (2.5)	27.0 (3.3)
G&G Semantic Associations ^c	51.5 (1.2)	50.6 (1.7)	51.0 (1.5)	49.7 (2.6)
G&G Confront.Naming ^d	35.5 (.83)	32.1 (2.4)	32.8 (2.1)	30.7 (3.1)
G&G Episodic Recognition ^e	27.3 (1.5)	26.3 (1.7)	26.8 (2.1)	26.9 (2.6)
G&G Episodic Distracters ^f	7.1 (2.2)	6.9 (2.2)	7.1 (1.6)	7.7 (1.3)
G&G Prospective Memory ^g	.13 (.35)	1.0 (1.0)	.69 (1.0)	1.8 (.94)
Animal Naming: Total ^h	22.9 (4.5)	16.4 (4.7)	19.3 (5.0)	15.0 (3.0)
Symbol Search Total ⁱ	39.3 (7.9)	30.9 (7.0)	26.5 (5.3)	18.1 (8.1)
Finger Tapping (FT): # Taps ^j	63.8 (9.9)	65.3 (6.1)	59.6 (12.1)	59.2 (11.1)
FT Simple Diff. Score ^k	-1.8 (8.3)	-9.5 (10.5)	-2.9 (7.8)	-13.09(15.56)
FT Complex Diff. Score ^l	-12.7 (18.9)	-49.5 (40.1)	-20.8 (20.4)	-56.9 (60.1)

Table Notes: G&G = Grasshoppers and Geese; MC = majority culture participants; WRAT-3 = Wide Range Achievement Test – Third Edition; CASI = Cognitive Abilities Screening Instrument (Teng et al., 1994); FT = Finger Tapping; * $p < .05$, ** $p < .01$, *** $p < .001$. ^aThe WRAT-III is scored out of a total of 57 points. ^bThe CASI is scored out of a total of 30 points. ^cSemantic associations is scored out of a total of 53. ^dThe confrontational naming score is out of a total of 36. ^eThe episodic recognition score is out of a total of 30. ^fThe G&G distracters score is out of a total of 9, with higher performance equaling more accurate discrimination of semantic distracters. ^gProspective memory is scored from 0 to 4, with 4 equaling worst performance. ^hThe animal naming score is the total number of animals named during a 60s timed trial. ⁱThe symbol search score is the total number of correctly identified items minus the number of incorrect items. ^jFinger tapping is the number of finger taps generated in a 15s trial, with the dominant index finger. ^kThe finger tapping simple dual task difference score is the single task tapping rate minus the simple dual-task tapping rate. ^lThe finger tapping complex dual task difference score is the single task tapping rate minus the complex dual-task tapping rate.

Table 2. Average Scores (SD) for young-middle and older age groups collapsed across cultural groups (i.e. majority culture and Cree background).

Dependent Variable	Young-Middle	Older
	<i>M(SD)</i>	<i>M(SD)</i>
G&G Semantic Association: Total Correct	51.07 (1.56)	50.42(2.15)
G&G Confrontational Naming	33.8 (2.47)	31.81(2.79)***
G&G Episodic Recognition: Total Correct	26.80 (2.27)	26.84(2.24)
G&G Episodic Recognition: Distracters	7.00(2.17)	7.40(1.45)
G&G Prospective Memory: Total Prompts	.54(.84)	1.18(1.12)**
Animal Naming: Total Words	19.63(5.59)	17.46 (4.72)*
Symbol Search Total Correct	35.10 (8.53)	22.89(7.77)***
Finger Tapping Rate: # of Taps	64.43 (8.38)	59.30 (11.4)
Finger Tapping Simple Difference Score	-1.79(8.27)	-2.92(7.83)
Finger Tapping-Complex Difference Score	-12.71(18.94)	-20.8(20.38)

* $p < .05$, ** $p < .01$, *** $p < .001$

Table 3. Average Scores (SD) for majority culture and Cree background participants collapsed across age group (i.e., young-middle aged and older adults).

Dependent Variable	Majority Culture	Cree
	<i>M(SD)</i>	<i>M(SD)</i>
G&G Semantic Association: Total Correct	51.26 (1.41)	50.15(2.20)*
G&G Confrontational Naming	34.06(2.11)	31.4(32.8)***
G&G Episodic Recognition: Total Correct	27.03(1.77)	26.60(2.66)
G&G Episodic Recognition: Distracters	7.10(1.88)	7.30 (1.82)
G&G Prospective Memory: Total Prompts	.42(.80)	1.4 (1.04)***
Animal Naming: Total Words	21.03(5.03)	15.78 (4.01)**
Symbol Search Total Correct	32.71(9.27)	25.19(9.81)***
Finger Tapping Rate: # of Taps	61.67(11.0)	62.79(8.78)
Finger Tapping Simple Difference Score	-4.57(12.18)	-11.09(15.56)
Finger Tapping-Complex Difference Score	-24.88(30.03)	-51.38(24.97)

* $p < .05$, ** $p < .01$, *** $p < .001$

General Discussion

A growing number of publications have highlighted significant limitations in current neuropsychological practice with culturally diverse individuals. Current assessment measures have typically not been validated for use with non-Caucasian, non-English speaking adults, and problems such as low or unknown diagnostic accuracy limit the utility or appropriateness of traditional neuropsychological assessment methods with individuals from minority culture backgrounds (Manly, 2006, 2008; Manly & Echemendia, 2007; Rivera Mindt et al., 2010; Romero et al., 2009). Manly states that “neuropsychological testing among culturally and linguistically diverse people is an area of critical vulnerability in the theoretical and empirical foundation for neuropsychological practice”(Manly, 2008, p.179). This dissertation examined cultural considerations in clinical neuropsychological practice with Cree-speaking Canadians residing in Saskatchewan. Four inter-related studies focused on understanding cultural perceptions of normal aging and dementia within a Canadian Aboriginal population, modifying existing screening and neuropsychological assessment instruments for use in both normal aging research and clinical practice, and investigating the role of culture in cognitive aging.

A key first step in culturally appropriate assessment of age-related cognitive impairment and dementia was to develop an understanding of cultural influences on perceptions of normal aging and dementia. There is little extant work on cultural explanations of aging and dementia in Canadian Aboriginal seniors, with the exception of a recent study with Canadian First Nation older adults (Hulko et al., 2010). Study 1 involved key informant interviews with a Grandmothers Group of Aboriginal seniors residing in Saskatchewan. One clear theme identified was the perception of changes in

memory and behaviour as aspects of the normal aging process and the related view of circularity of the life cycle, which is a prevalent symbol within Aboriginal culture. Previous research has identified similar patterns in other cultures that view memory loss in older adults as a normal part of the aging process, referring to this stage of life as a “second childhood” (Hinton, Guo, Hillygus, & Levkoff, 2000; Hulko et al., 2010; Kramer, 1996). A second theme emphasized that the recent loss of traditional practices and ways of life has profoundly impacted views of normal aging and caregiving roles. The Grandmothers expressed a belief that current higher rates of illness and age-related diseases were strongly linked to changes away from a traditional lifestyle that emphasized healthy traditional foods and physical exercise. Again this theme emerged in a recent study with Aboriginal seniors in British Columbia (Hulko et al., 2010) and is also similar to findings with a subset of Puerto-Rican and Dominican family caregivers residing in the United States, whose stories of the nature and meaning of dementia highlighted the link between traumatic lifestyle changes, loneliness, and changes in family caregiving responsibilities and dementia (Hinton & Levkoff, 1999). The third theme that emerged from the key informant interviews was that barriers in communication and cultural sensitivity continue to affect Aboriginal individuals’ experiences of the healthcare system. This was consistent with Cammer’s (2006) research which identified the perception of healthcare systems as culturally insensitive for Northern Saskatchewan community residents. The Grandmothers provided clear direction in addressing the current gaps in providing culturally relevant healthcare and, in particular, emphasized the importance of incorporating humour, colour, and familiar

visual images into formal assessment measures, and increasing engagement and comfort during assessment procedures.

This third theme directly informed the modifications of the Community Screening Interview for Dementia (CSI 'D'; Hall et al., 1993) and The Pyramids and Palm Trees (Howard & Patterson, 1992), renamed by our research group and the Grandmothers as the G&G (Lanting et al., 2007). These measures, which formed the basis for Study 2 and 3, incorporated engaging and colourful images, humour, and familiar images into test stimuli. Overall, qualitative analysis of the key informant group interviews facilitated the development of culturally appropriate clinic procedures, and the revision of assessment protocol to reflect Saskatchewan Aboriginal identity and experience (Lanting et al., in press).

For Study 2, The Community Screening Interview for Dementia (CSI 'D') was further modified through the key informant interviews with the Grandmothers, in consultation with Northern healthcare providers, and through pilot work at the Rural and Remote Memory Clinic. Study 2 examined the utility of this further modified CSI 'D' and the Cognitive Abilities Screening Instrument (CASI; Teng et al., 1994) with four clinical case studies: Cree-speaking adults referred from remote Aboriginal communities who had limited formal education (two of whom were not literate). Family members were present to provide translation as needed and to offer collateral information. All participants and their family members reported satisfaction with the assessment procedures and commented on the comfortable interview and assessment process. This study was the first to our knowledge that has modified and evaluated, in a preliminary manner, cross-cultural screening measures for use in a clinic setting with Canadian Cree-

speaking Aboriginal seniors. Nevertheless, several difficulties remained with using these modified instruments within our clinic. Importantly, literacy and some formal education were required to complete some of the items. The results from Study 2 have sparked additional ongoing work with Northern healthcare providers to generate a screening protocol appropriate for individuals who have no formal education or limited exposure to urban culture. This ongoing research will help to establish an appropriate tool for more accurately detecting cognitive impairment in a clinical setting, for individuals with little or no formal education and exposure to urban culture. Moreover, developing this screening instrument will allow accurate epidemiological research in dementia prevalence in Canadian Aboriginal seniors and will provide an opportunity to extend Hendrie et al.'s (1993) work with Aboriginal populations in Canada.

The key informant interviews with the Grandmothers Group provided the basis for the development of the G&G. Normative data were collected with a sample of healthy participants (of majority culture and Cree background) and with a clinical sample, and the G&G was examined for its utility as an assessment measure in a Rural and Remote Memory Clinic. Although we initially developed the semantic associations task, modelled after the Pyramids and Palm Trees, measures of confrontational naming, episodic recognition memory and prospective memory were developed subsequently based on the popularity of the test stimuli with both research and clinical participants. All measures in the G&G demonstrated good criterion-related and construct validity with the clinical sample, and differentiated healthy participants from patients who had been diagnosed with AD. For the healthy older adult sample, the semantic associations task yielded adequate criterion-related validity, and the confrontational naming and prospective

memory tasks showed adequate convergent validity. All G&G subtests generated excellent sensitivity and good specificity in differentiating healthy older adults from adults with AD or other dementias. Self-identified cultural background did predict performance on some of the subtests and there were significant differences in education and reading ability (i.e., WRAT-3 Reading subtest) between the two cultural groups. In the Cree sample, the WRAT-3 Reading score was taken as a measure of familiarity with urban culture, acculturation, and English language proficiency, rather than a measure of intellectual functioning, consistent with the recommendations of Manly and colleagues (Manly & Echemendia, 2007; Manly et al., 1999; Manly, 2006). This work underscores the need to consider and further investigate the effect of demographic variables for which cultural background might serve as a proxy. Future research is also needed to examine the reliability and validity on all of the G&G subtests with both a larger normative and clinical sample. Additionally, examining performance on the G&G by diagnosis and stage of dementia will provide information on the differential diagnostic utility and sensitivity of this measure.

The rationale for Study 4 was to collect normative data on neuropsychological test performance in Cree-speaking Aboriginal adults and to examine Park et al.'s (1999) theory on cultural influences on cognitive aging. Park's body of research suggests that on tasks where there are cultural effects, cultural differences will magnify with age if a task is non effortful but will converge with age on tasks that are effortful. For tasks that showed cultural differences, there were no interactions with age group, suggesting similar aging trajectories across the cultural groups on cognitive functioning. We examined test performance on the G&G and traditional measures of higher brain functioning in a

sample of young-middle and older adults of Cree background, residing in both urban and remote communities of Saskatchewan. These participants were compared to a sample of age-equivalent Caucasian individuals residing in rural or remote regions of Saskatchewan in order to investigate cultural differences in cognitive aging. Interestingly, there were no significant interactions between cultural group and age group in the current study in contrast to our hypotheses based on work by Park and her colleagues (Park & Gutches, 2002; Park et al., 1999). Predicted age differences were seen in favour of younger adults for measures of confrontational naming, prospective memory, verbal fluency, and processing speed. Regarding cultural differences, the majority culture sample had higher mean scores on semantic associations, confrontational naming, prospective memory, verbal fluency, and processing speed. There were no cultural differences in basic motor speed or on a task of divided attention. Although the measures of semantic store, naming, and prospective memory were modified for use with culturally and linguistically diverse older adults, there were still cultural differences in performance. Again, as in Study 3, the two cultural groups differed on several important demographic variables, including education, reading level, first language, and geographical background. Although these differences accurately reflect the demographics of the communities sampled and would be similar to older adults being referred to the Rural and Remote Memory Clinic for assessment, these differences limit the interpretation of the effects of “culture” on cognitive test performance. Similar to the findings in Study 3, cultural group is arguably an important proxy variable for other factors that could account for discrepancies in test performance. An additional explanation for the cultural differences in performance is that the health status of Aboriginal populations has been shown to be poorer in Canada

(Wilson et al., 2010). More chronic health conditions and cerebrovascular risk factors may result in an accelerated cognitive aging process. Future research examining the role of health disparities on cognitive performance in older adults of Aboriginal background is needed. Importantly, the data from Study 4 do not lend support to the notion that Aboriginal populations employ differential cognitive styles as suggested by previous researchers (i.e., Tafoya, 1982 and Tharp, 1994).

The challenges in data collection highlighted the practical issues conducting cross-cultural research in clinical neuropsychology. I endeavored to travel to remote Northern communities for three summers in order to establish partnerships, conduct fieldwork, and recruit participants to participate in these research studies. Establishing partnerships in the communities and gaining trust of community members to participate in a project on neuropsychological test performance was challenging among individuals whose beliefs about assessment were associated with negative consequences or memories (e.g., of residential school attendance). However, with increased familiarity and time spent in the community and participating in community events, members of the Northern villages of Ile-a-la-Crosse and Buffalo Narrows eventually expressed strong interest in the project and the need to understand more about dementia in Aboriginal individuals. The engaging and nonthreatening nature of the G&G was also cited by participants as responsible for their positive reaction to the assessment. In contrast, some of the more traditional neuropsychological measures (e.g., finger tapping, assessing divided attention with a dual task paradigm) were described as onerous and unpleasant and several participants, particularly older adults, chose to discontinue those tasks, which resulted in

a low number of participants for some of the measures in Study 4. Future studies that also focus on pleasant and informal assessment procedures will likely enhance participation.

There are several overall limitations to this program of research. Firstly, the effects of culture on conceptions of aging and dementia, development of more culturally appropriate assessment measures, and generation of normative data were explored with a specific Aboriginal group: Cree-speaking individuals of either Northern Cree or Métis descent. This group was chosen because Cree speaking older adults comprise the majority of the Aboriginal patient referrals to the Rural and Remote Memory Clinic. We also focused on Northern Cree and Métis individuals to limit heterogeneity and variability in test performance that could be accounted for by language difference and variability in cultural experience and geographical background. Consequently, this research does not directly inform our understanding of normal aging and dementia in other Aboriginal groups residing in Saskatchewan and we cannot assume the appropriateness or translatability of the screening measures with individuals of other cultural backgrounds or with different languages. Further research is needed to establish the utility of these measures with other Canadian Aboriginal groups and other cultural minorities residing in Saskatchewan.

Secondly, the sample size and truncated age ranges in Study 4 limit the strength of our conclusions and generalizability of the findings. Our sample was based on a convenience sample and we had difficulty recruiting both young adults and older adults. As such, we categorized age groups as “young-middle” and “older” and this likely limited our ability to detect true age differences, or age by culture interactions, because

the mean age difference between the two groups was lower than in most normal aging studies.

Thirdly, the G&G illustrates an effective approach to more culturally appropriate assessment; however, the stimuli were carefully chosen and evaluated to be highly familiar more broadly to individuals residing in rural and remote prairie regions. Therefore, the utility of this measure with other geographical regions is limited, or at best, unknown. This measure is anticipated to be useful in clinical settings in prairie regions; however, the concept of adapting this measure to be more engaging and familiar can be extended to other areas of the world and alternate stimuli can be incorporated to better suit the cultural and geographical background of the population for which the test is being adapted.

Finally, level of acculturation has been highlighted as an important variable in understanding cultural differences in neuropsychological test performance and this might account for within group differences in performance (Manly, et al., 1998a, 1998b). Although acculturation was not directly measured as a variable in my program of research, for Studies 3 and 4, information on engagement in cultural practices was gathered as an approximation of this variable. As Landrine and Klonoff (1996) describe, acculturation is the level to which people participate in the values, language, and practices of their cultural community rather than those of the majority culture. Since we did not use a direct assessment of level of acculturation this is a limitation to better understanding the role of acculturation in test performance. It is also possible that stereotype threat contributed to performance on the neuropsychological measures in the Cree speaking sample. Recommendations to minimize the impact of stereotype threat on

performance include obtaining demographic information and self-identification of cultural background following administration of the cognitive measures.

This dissertation represents a preliminary step in understanding cultural influences in aging and dementia in Canadian Aboriginal populations, obtaining normative data on neuropsychological measures with individuals of Cree background, and exploring the pattern of cognitive aging in Cree adults, when compared to adults of Caucasian background. Future work is needed in order to continue our understanding of cultural conceptions of aging and dementia within other Aboriginal Canadian groups and to better understand cultural differences in cognitive aging. Additionally, continuing to collect normative data with individuals with low educational attainment will assist in reducing the current bias in test norms. Several researchers have highlighted that test norms are insufficiently adjusted for education at the low end of the education range (Liu et al., 1994; Teng & Manly, 2005) and that individuals with no or few years of schooling, including a higher percentage of older individuals, females, rural residents, and ethnic minorities, tend to score at the low end of the normative group and therefore are more likely to be considered impaired (Liu et al., 1994; Teng & Manly, 2005). Given that minority older adults tend to have lower educational attainment than those of majority culture, continuing to collect information on healthy cognitive test performance in individuals with little education is important to provide an appropriate comparison group for such individuals presenting for clinical assessment and to reduce the chance of false positives in dementia diagnosis.

The findings of this program of research are consistent with previous reports (Scruggs & Lifson, 1985) and indicate that ethnic minority elders have limited experience

taking tests, lack general test-taking skills, and may not highly value the assessment process. Our older Cree participants were not comfortable with formal assessment procedures, tended to value time taken to complete a task thoroughly rather than quickly, and tended to discontinue tasks that were not considered pleasant or engaging. Future studies that also focus on pleasant and informal assessment procedures will likely enhance participation. Further test development work is needed to establish measures of other higher brain functions (e.g., attention, executive functioning, and visuospatial ability) that are engaging, acceptable, and appropriate for Aboriginal individuals referred for clinical assessment of cognitive functioning.

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Appendix A: Consent Form for Study 1

You are invited to participate in a study entitled “Developing a culturally sensitive neuropsychological approach for identifying cognitive impairment and dementia in older Aboriginal adults”. Please read this form carefully and feel free to ask questions you might have.

Researchers: Margaret Crossley, Dept. of Psychology, Univ. of Sask., 9 Campus Drive, Saskatoon, Sk., S7N 5A5. Tel: 966-5925, FAX: 966-6630, email: crossley@sask.usask.ca.

Shawnda Lanting, Department of Psychology, University of Saskatchewan

Purpose and Procedure: We are inviting you to participate in a series of focus groups to provide feedback on an approach we are developing for identifying cognitive impairment and dementia in older Aboriginal adults that is intended to be culturally sensitive and fair. Should you agree to participate, we will ask you to meet with us, together with other volunteers from the Grandmothers Group, for approximately 1 ½ hours on a monthly basis for the next 6 months. During the first group, we will describe the currently used assessment procedures and summarize some of the information we have collected from the literature related to cognitive impairment and dementia among older Aboriginal adults. Next, we will describe our proposed procedures for a culturally sensitive assessment based on our understanding of the literature we have reviewed during the past few months. Finally, we will ask you to provide feedback to us about our proposed method of assessment and to discuss ways that memory difficulties in older adults are currently managed among Aboriginal peoples. We would like to audiotape some of the group discussion if this is acceptable to all volunteers. If this procedure is not acceptable to everyone, then we will ask that you permit one of the researchers to record (in written form) the questions and responses of group members. After the focus groups and prior to the preparation of a final report, the researchers will prepare a written summary of the proceedings (i.e., a transcript) and you will be given an opportunity to review this material and to add, alter, or delete information from the transcript as appropriate. Finally, you will be asked to sign a transcript release form indicating that you believe that the transcript accurately reflects what was said during the focus group. We will modify our proposed assessment procedures based on the feedback we obtain from the focus group and prepare a brief follow-up presentation for a future meeting of the Grandmothers Group describing these modifications.

You will receive a \$35.00 honorarium each time you participate in a focus group. In order to receive the honorarium, you will be asked to provide your name, address, and Social Insurance Number (SIN), if available. Canada Customs and Revenue Agency requires the University to document this information for each honorarium paid, but it is not taxable.

Potential Risks: In preparation for this study, the researchers have consulted broadly with Aboriginal health researchers, health professionals and administrators working with Aboriginal peoples, and elders experienced in providing consultation to university

students and researchers. Although we do not anticipate that you will experience any harm or discomfort as a result of participating in this study, one of the researchers (Margaret Crossley) is a clinical psychologist who will be available to meet with you should you experience any emotional discomfort or stress as a result of your involvement.

Potential Benefits: Although there may not be any direct benefits to you as a result of participating in this study, the information that you provide will help to guide our work in developing a culturally sensitive approach to the assessment of older Aboriginal adults. Because illnesses that result in cognitive impairment and dementia have a significant impact on the individual, the family members and other caregivers, and on the broader community, it is important that we develop assessment procedures that will enable health workers to accurately identify these problems and to begin to understand and describe helpful ways of caring for individuals with these illnesses.

Storage of Data: Audio tapes from the focus group (assuming all participants consent to be taped) and the written transcriptions from the tapes and meetings will be stored securely in a locked office at the Aging Research and Memory Clinic for a period of at least five years following the completion of the study. Margaret Crossley, Director of the Aging Research and Memory Clinic, will assume full responsibility for the secure storage of this material.

Confidentiality: The final results of the study will form the basis of articles submitted to peer-reviewed journals for publication and will be presented at relevant conferences. Although direct quotations may be used in the final report and publications, every care will be taken so that individuals cannot be identified. No names of individuals or facilities will be attached to any of the information collected, or mentioned in any study report. The focus group transcripts will contain no names, and will be securely stored as described above. By virtue of participating in a focus group, the level of confidentiality might be reduced, therefore all participants will be requested to keep the details of the focus group (e.g., who said what) confidential.

Right to Withdraw: You may withdraw from the study for any reason, at any time, without penalty of any sort (and without loss of relevant entitlements, without affecting academic or employment status, without losing access to relevant services, etc.). If you withdraw from the study at any time, any data that you have contributed with be deleted from the written transcripts.

Questions: If you have any questions concerning the study, please feel free to ask at any point: you are also free to contact the researchers at the address or numbers provided above if you have questions at a later time. This study was approved on ethical grounds for a 5-year period by the University of Saskatchewan Advisory Committee on Ethics in Behavioral Science Research on June 28, 2002. Any questions regarding your rights as a participant may be addressed to that committee through the Office of Research Services (966-4053).

Consent to Participate: I have read and understood the description provided above. I have been provided with an opportunity to ask questions and my questions have been answered satisfactorily. I consent to participate in the study described above, understanding that I may withdraw this consent at any time. A copy of this consent form has been give to me for my records and I have received the \$35.00 honorarium.

(Signature of Participant)

(Date)

(Signature of Researcher)

DATA/TRANSCRIPT RELEASE FORM

I, _____, have reviewed the complete transcript of the focus group that I participated in as part of this study, and have been provided with the opportunity to add, alter, and delete information from the transcript as appropriate. I acknowledge that the transcript accurately reflects what I said during the focus group with Margaret Crossley and Shawnda Lanting. I hereby authorize the release of this transcript to Margaret Crossley and Shawnda Lanting to be used in the manner described in the consent form. I have received a copy of this Data/Transcript Release Form for my own records.

Participant

Date

Researcher

Date

Appendix B: Summary of CSI'D Revisions

Wording Changes

Elderly—older adults

Relative—translator

Subject—patient

Translator

Relationship to patient

added community health care worker

Age: _____ years (translator)

Residential History

1. You currently live here at _____ how long have you lived here?

Where do you currently live?

5. During your life have you ever lived in Prince Albert, Saskatoon, or another large city like Saskatoon for more than ten (10) years?

During your life, have you ever lived in a large city like Saskatoon for more than 10 years?

Interview with Patient

Occupation—how did you make your living? (or) about what kind of work you did?
(intro)

Remember my name: Last name—first name

Language expression-definition

What is a bridge?—What is a table? (a piece of furniture)

Added-similarities

1. Arm-leg
2. Laughing-crying
3. Eating-sleeping

Language expression-repetition

Added English phrase: The sun is rising in the East

Language expression-naming fluency

Articles of clothing—pieces of clothing

Registration

Grammar change

Attention and Calculation

Grammar change

Recall

Boat. House, fish

Added: prompts

1. Boat: something used for travel...car, truck, boat
2. House: a building...School, house, hospital
3. Fish: something you eat...fish, chicken, deer

24. If someone gave you this amount, 35 cents, as change from a dollar, \$1.00 (one looney) how much did you spend?

Changed to : If someone gave you this amount, 35 cents, how much more do you need to make \$1.00 (dollar). [Show patient additional pile of coins in which to make change for \$1.00]

Orientation to place

25. What is the name of your reserve

Changed to: What is the name of this reserve or town?

25. What is the name of the chief of this band?

Changed to: What is the name of the leader in your community?

27. Where are we now?

Changed to: Where are we right now?

28. What is the name of the lake back home?

Changed to: What is the name of the lake nearest to your home?

29. Whose house is next to your house?

Changed to: Who is your closest neighbour?

Orientation to Time

Added: What is the day of the month?

33. What part of the day is it?

Changed to: What time of the day is it

[if response is morning, afternoon, etc, prompt for time]

What season is it? [is it winter, summer, fall, or spring?] Added as a secondary cue, instead of within the initial question

Language comprehension

35. ...put the paper down on your lap

Changed to: hand the paper back to me

Memory

Before reading story-add 3 word delayed recall

Writing-Added

Please write...I would like to go home

Reading-added

Read and Obey: Close your eyes

Language expression-spontaneous speech

Omit section

Substitute: tell me a story about your childhood

Interview with Relative

5. Have you seen a change in his/her daily activities in the past several years? Please describe.

Change to: over the past year

Does the interviewer—do you?

Appendix C: Behavioural Ethics Review Board Ethics Approval for Studies 1,2, & 3

Appendix D: Approval from Keewatin Yatthe Health Region

Appendix E: Consent Form for Study 3

You are invited to participate in a study entitled “**Developing a culturally sensitive neuropsychological approach for identifying cognitive impairment and dementia in older Aboriginal adults**”. Please read this form carefully and feel free to ask questions you might have.

Researchers: Margaret Crossley, Dept. of Psychology, Univ. of Sask., 9 Campus Drive, Saskatoon, Sk., S7N 5A5. Tel: 966-5925, FAX: 966-6630, email: crossley@sask.usask.ca.
Shawnda Lanting, Department of Psychology, University of Saskatchewan

Purpose and Procedure: We are inviting you to participate in a study which involves completing tasks that have been developed for the identification of cognitive impairment and dementia in older Aboriginal adults. These tests have been designed to be culturally appropriate and fair. In order to complete this study, we need to gain information about how healthy Aboriginal adults perform on these newly developed tests. Should you agree to participate, we will ask for approximately 1 hour of your time at your convenience. You will receive a small gift for your participation in this study.

Potential Risks: In preparation for this study, the researchers have consulted broadly with Aboriginal health researchers, health professionals and administrators working with Aboriginal peoples, and elders experienced in providing consultation to university students and researchers. Based on our previous experience using these instruments with older Aboriginal adults, we do not anticipate that you will experience any harm or discomfort as a result of participating in this study.

Potential Benefits: Although there may not be any direct benefits to you as a result of participating in this study, the information that you provide will help to guide our work in developing a culturally sensitive approach to the assessment of older Aboriginal adults. Because illnesses that result in cognitive impairment and dementia have a significant impact on the individual, the family members and other caregivers, and on the broader community, it is important that we develop assessment procedures that will enable health workers to accurately identify these problems and to begin to understand and describe helpful ways of caring for individuals with these illnesses.

Storage of Data: That data collected during this study will be securely stored in a locked office at the Aging Research and Memory Clinic for a period of at least five years following the completion of the study. Margaret Crossley, Director of the Aging Research and Memory Clinic, will assume full responsibility for the secure storage of this material.

Confidentiality: All information you provide will be kept completely confidential. Your name will not be associated with your information. Instead, you will be assigned a

participant number, which will be used to identify your information, but will not appear on any forms with your name on them. This consent form and all other forms on which your name appears will be stored in a separate location.

The information collected in this study will form the basis of a dissertation and may be summarized in journal articles and/or professional conference presentations. At all times, only group data will be reported; individual participants will not be identified.

Right to Withdraw: Participation in this study is voluntary, and your decision to participate will not impact on any clinical services that would otherwise be available to you (e.g. assessment, treatments, relevant entitlements, etc.). You may withdraw from the study for any reason, at any time, without penalty of any sort. If you withdraw from the study at any time, any data that you have contributed will be deleted from our records.

Questions: If you have any questions concerning the study, please feel free to ask at any point; you are also free to contact the researchers at the address or numbers provided above if you have questions at a later time. This study was approved on ethical grounds for a 5-year period by the University of Saskatchewan Advisory Committee on Ethics in Behavioral Science Research on June 28, 2002. Any questions regarding your rights as a participant may be addressed to that committee through the Office of Research Services (306-966-4053). Out of town participants may call collect. We will be returning to your community within a year to provide an oral presentation of our findings once the study has been completed.

Consent to Participate: I have read and understood the description provided above. I have been provided with an opportunity to ask questions and my questions have been answered satisfactorily. I consent to participate in the study described above, understanding that I may withdraw this consent at any time. A copy of this consent form has been given to me for my records and I have received a small gift.

(Signature of Participant)

(Date)

(Signature of Researcher)

Appendix F: Oral Questionnaire

Oral Questionnaire

Participant #: _____

Date: _____

I would like to ask you a few questions about yourself. Before we begin, I would like to remind you that your responses are anonymous and will remain completely confidential. If you are not comfortable responding to one or more of the questions, you do not have to give me an answer.

Note participant's gender: _____

What is your current age? _____ years

What is your country of birth? _____

How many years of formal schooling do you have? _____

What is the highest level of schooling you completed?

1. some primary school
2. Completed primary school
3. Some high school
4. Completed high school
5. Technical training beyond high school
6. College or some university
7. University undergraduate degree
8. University graduate degree

Next I would like to ask you about the languages you can speak. I only need to know about only the languages that you feel you are fluent in, or can carry a conversation in.

What languages can you speak today? _____

Is English your first language? **Yes** **No**

If not, what is your first language? _____

When did you learn English? _____

What is (are) your preferred language(s)? _____

Which cultural group do you most closely identify with?

1. Northern Cree
2. Plains Cree
3. Nakota
4. Chipewyan
5. Salteaux
6. Dakota-Sioux
7. Metis Nation
8. Other_____

Do you engage in traditional cultural practices? **Yes** **No**

If so, please describe_____

(e.g., sweats, burning sweatgrass or sage in the home, hunting, eating wild meat and fish, etc.)

Now I would like to ask you a history of major injuries or diseases. Have you ever had a head injury or significant illness in the past (e.g. epilepsy, aneurysm, etc)

Appendix G: Sample Triad for Grasshoppers and Geese Semantic Associations Task

Appendix H: Grasshoppers and Geese Manual (Draft Form)

**The Grasshoppers and Geese Test:
A Memory and Language Battery Using Prairie Images**

General Description

The Grasshoppers and Geese Test has been developed as a modification of the Pyramids and Palm Trees Test, a test of semantic access from pictures and words. The purpose of Grasshoppers and Geese Test is to assess the domains of semantic memory, episodic recognition, confrontational naming, and prospective memory in individuals living in rural regions of Western Canada. The semantic association component assesses a person's ability to access detailed semantic representations from pictures. This task is split into two halves and incorporates a prospective memory component. The second half is administered when all other tests have been completed. A word version is also available. The episodic recognition test is given following a brief delay and assesses recognition memory for images that have been viewed earlier as part of the first half of the semantic association task. This is a thirty item test with 10 target items and 20 distracters (i.e., not viewed previously). The confrontational naming task involves naming 18 familiar images, some of which have been viewed previously in the semantic association task. This test has been designed to incorporate images in easy, medium, and difficult categories (6 items of each difficulty gradient in ascending order).

Semantic Association- 1st Half

Administration

Examiners should do their best to ensure that patients do not perform poorly because they fail to understand the idea of the task. Therefore, two practice triads are provided to allow administrators to instruct patients on the test.

The instructions are as follows:

"Here are three pictures. You have to decide which one of these two at the bottom goes with the one at the top....Is it this one or this one?" (point as appropriate)

On the first practice triad, if the subject responds correctly, the examiner should say:

"That's right, they go together because mittens and a toque are both worn in winter."

If the subject responds incorrectly, the examiner should say:

"No. The mittens go with the toque because they are both worn in winter."

For the second practice triad, the examiner should say:

"Now try this one. Which of these two pictures goes with the one at the top?"
(pointing as appropriate).

If the subject responds correctly, the examiner says:

"That's right, they go together because an egg is laid by a chicken."

If the subject responds incorrectly, the examiner says:

"No. The chicken goes with the egg because the egg is laid by a chicken."

With some patients, these instructions may need to be supplemented with further help and instruction by example on the practice triads to try to make sure that the subject has the idea of what is involved. With some patients, it may help to present the tests as a game of guessing the connection between the items that the test compilers had in mind.

Following administration of the sample triads, the examiner says:

"Here are some more. Although I can't give you any clues or feedback on your choices, you can ask me questions about the test when we are all finished if you are curious."

On the test triads, NO FEEDBACK IS ALLOWED. In particular, no feedback is given regarding the image label. If the patient reports that they do not recognize the image, they should be encouraged to guess based on the other images.

Patients will sometimes want to say that the two choice items go together. The experimenter should then reiterate: **“You have to choose which of these two goes with the one at the top.”** (point as needed). This reiteration can be provided as many times as needed.

If the subject is unsure, he or she should be strongly encouraged to guess.

Ensure that the examinee gets at least five seconds of exposure per triad (to ensure for the recognition task). The examiner must flip the pages to control the time of exposure. If there is no reply after 20 seconds, prompt the patient with **“Any ideas?”**

Following the administration of Item 27, introduce the prospective memory cue:

“We are going to finish the second half of this test a little later when we have finished all of the other tasks. When you hear me say that we have now completed all of the tests, please remind me that we have the rest of the Grasshoppers and Geese to complete”.

Scoring

The score is the total number of correct responses. Each correct item is worth one point. A number correct and percentage correct is generated for the first half of the test.

Episodic Recognition

(given after a brief delay: usually the WRAT-3 Reading)

Administration

The instructions are as follows:

“A little while ago, we looked at pictures that were in threes and you had to decide which of the two bottom pictures went with the top picture. Now I am going to show you some more pictures on their own. Some of the pictures are the same as one of the pictures in the sets of three pictures I showed you earlier and some are not. I want you to tell me whether each picture is one you saw earlier or if it is new. Again I can’t give you any feedback on your choices, but if you are curious we can talk at the end of testing. For each picture, ask Is this picture one you saw earlier?”

Scoring

The score is based on 1 point for each correctly recognized item. The total score is 36.

Norms

to be added

Confrontational Naming

Administration

“I am going to show you some pictures and I want you to tell me what they are.”

Provide the semantic cue only if item is clearly misperceived

If a superordinate category label is given, prompt for more specific label. Record the original response and the response after the cue or category label prompt is given. Also record if a cue or category label prompt is given

Scoring

Each item is worth a total of two points. If correct label is provided, two points are given. If a semantic cue is provided and the correct answer is provided, then two points are given. If an incorrect answer is provided, no points are given. If a superordinate category label prompt is provided and the correct answer is given, then give two points. However, if the answer is not improved in specificity, then give only one point (e.g., “flowers” for “sunflowers”).

Norms

to be added

Prospective Memory

Administration

Instructions are as follows:

“We have now finished all of the tests...”

Prompt 1: “Was there something that you were going to remind me of?”

Record response. If no response after 5-10 seconds or if incorrect guess is provided, then give second prompt.

Prompt 2: “Is there something more we need to do now that we have finished all the other tests?”

Record response. If response is incorrect or there is no response after 5-10 seconds, then give third prompt.

Prompt 3: “Do you remember that I asked you to remind me that we have the rest of the first test to complete?”

Record response.

Scoring

Correct response after cue	Score=0
Correct response after 1 prompt	Score=1
Correct response after 2 prompts	Score=2
Correct response after 3 prompts	Score=3
Incorrect response after 3 prompts	Score=4

Norms

to be added

Grasshoppers and Geese-2nd Half

(administered immediately after the Prospective Memory component)

Administration

Repeat instructions from the first half as necessary....

"Here are three pictures. You have to decide which one of these two at the bottom goes with the one at the top....Is it this one or this one?" (point as appropriate)

Scoring

A total score and percent correct score is generated after the administration of both halves of the semantic association task.

Norms for Semantic Association

to be added

Appendix I: Grasshoppers and Geese Semantic Associations Record Form

The Grasshoppers and Geese Scoring Sheet-1st Half

mittens	<u>Sample</u> toque	cowboy hat
egg	<u>Sample</u> chicken	Pig
1. cowboy/straw hat	parka	jean jacket
2. canoe	oar/paddle	baseball bat
3. rainbow	rain jacket	parka
4. lasso/lariat	calf	bear cub
5. fish	fishing rod	gun/rifle
6. winter scene	running shoes	snowshoes
7. bales/hay	cattle	pigs
8. wool yarn	lamb	calf
9. hockey stick	puck	soccer ball
10. cheese	elk	goats
11. pond/lake	goose	owl
12. fawn	doe	buck
13. eagle	evergreens/birch trees	bushes
14. grain elevator	wheat	brown-eyed susans
15. Halloween masks	pumpkin	carrots
16. sled	husky	mule/donkey
17. mug/coffee cup	doughnuts	carrots
18. mouth	guitar	harmonica
19. grain auger	garden shed	grain bin
20. winter scene	motorcycle	skidoo/snowmobile
21. rodeo clown	barrel	crate
22. rain puddle	clouds	sunshine
23. buffalo/bison	flint/rock	arrowhead
24. sprayer	thistle	brown-eyed susans
25. snowman	robin	chickadee
26. bat	Canada goose	owl
27. goose	bee/wasp	grasshopper

First half score: ____/27**First half percent correct: ____%**

The Grasshoppers and Geese Scoring Sheet-2nd Half

	Item	Item
28. wheat field	buns/bread	salad
29. BBQ	Cattle	horses
30. trees/forest	Handsaw	chainsaw
31. wasp nest	Spider	wasp/hornet
32. pillow	Bed	chair
33. nailbrush	finger nails	teeth
34. razor	Forehead	cheek/chin/stubble
35. farming fields	lawnmower	tractor
36. combine	wheat	bullrushes/cattails
37. sheep	black lab	border collie
38. frying pan	Goldfish	trout
39. fence post	Canada goose	meadow lark
40. hand	Mittens	slippers
41. woodpile	Handsaw	mallet/hammer
42. spider web	Spider	ants
43. ski tracks	cross-country skiis	snowshoes
44. log cabin	Furnace	woodpile
45. winter/snow	baby/ball	hockey player
46. legislative building	prairie lily	brown-eyed susans
47. toast with knife	watermelon	strawberries
48. dandelion	thistle	petunia
49. skunk	onions	carrots
50. caterpillar	butterfly	dragonfly
51. blue jay/birdfeeder	Brown-eyed susans	sunflowers
52. Ukranian easter egg	candle	lamp
53. lynx	dog	domestic cat

First half score: ____/27

First half percent correct: ____%

Second half score: ____/26

Second half percent correct: ____%

Total score: ____/____**Total Percent Correct**____%

Appendix J: Grasshoppers and Geese Episodic Recognition Record Form

Episodic Recognition
Record Form

A little while ago, we looked at pictures that were in threes and you had to decide which of the two bottom pictures went with the top picture. Now I am going to show you some more pictures on their own. Some of the pictures are the same as one of the pictures in the sets of three pictures I showed you earlier and some are not. I want you to tell me whether each picture is one you saw earlier or if it is new. Again I can't give you any feedback on your choices, but if you are curious we can talk at the end of testing." For each picture, ask "Is this picture one you saw earlier?"

1. raccoon	yes	no	16. hockey stick	yes	no
2. grain elevator	yes	no	17. flowers	yes	no
3. quilt	yes	no	18. grain bin	yes	no
4. hockey skates	yes	no	19. ladybug	yes	no
5. buck	yes	no	20. quonset	yes	no
6. cowboy boots	yes	no	21. fiddle	yes	no
7. bear cub	yes	no	22. robin	yes	no
8. chokecherries	yes	no	23. teepee	yes	no
9. pie crust	yes	no	24. canola field	yes	no
10. gopher	yes	no	25. eagle	yes	no
11. buffalo	yes	no	26. skiffs	yes	no
12. doughnuts	yes	no	27. dog	yes	no
13. magpie	yes	no	28. ladyslippers	yes	no
14. wolf	yes	no	29. husky	yes	no
15. toboggan	yes	no	30. toothbrush	yes	no

Scoring

Total Score: /30

Percentage Correct : %

Appendix K: Grasshoppers and Geese Confrontational Naming Record Form

**Grasshoppers and Geese Confrontational Naming
Record Form**

I am going to show you some pictures and I want you to tell me what they are.

- provide semantic cue if item is clearly misperceived
- If superordinate category label is given, prompt for more specific label

Item	Response	Semantic Cue Needed? (circle)	Category Label Needed?	Response	Score (0-2)
1. mug/coffee cup		you drink out of it			
2. skunk		an animal			
3. bat		an animal			
4. guitar		a musical instrument			
5. strawberries		a fruit			
6. razor		used in grooming			
7. butterfly		an insect			
8. sunflowers		A type of flower			
9. soccer ball		a type of sports equipment			
10. carrots		a vegetable			
11. grasshopper		an insect			
12. lamp/lantern		a source of light			
13. caterpillar		an insect			
14. dandelion		a weed			
15. grain auger		a type of farm equipment			
16. fawn		an animal			
17. dragonfly		an insect			
18. Canada goose		a bird			

Scoring:

Give score of 2 if correct label is provided. If superordinate category label prompt or semantic cue is provided and the correct label is then provided, then give a score of 2. If response does not improve after superordinate category label prompt, give a score of 1.

Total Score: /36

Percentage Correct : %

Examples of superordinate category labels:

1. mug/coffee cup	cup
2. skunk	animal or weasel
3. bat	animal or mammal
4. guitar	a musical instrument
5. strawberries	fruit or berries
6. razor	grooming utensil
7. butterfly	insect
8. sunflowers	flowers or crop
9. soccer ball	ball or sports equipment
10. carrots	vegetable
11. grasshopper	insect
12. lamp	appliance or source of light
13. caterpillar	larva or insect
14. dandelion	plant or weed
15. grain auger	farm equipment
16. fawn	deer/baby deer
17. dragonfly	insect
18. Canada goose	goose/bird

Appendix L: Consent Form for Study 4

CONSENT FORM

You are invited to participate in a study entitled “**Attention, Memory, and Language in Healthy Adults: A Cross-Cultural Approach**”. Please read this form carefully and feel free to ask questions you might have.

Researchers: Margaret Crossley, Dept. of Psychology, Univ. of Sask., 9 Campus Drive, Saskatoon, SK., S7N 5A5. Tel: 966-5925, FAX: 966-6630, email: crossley@sask.usask.ca.
Shawnda Lanting, Department of Psychology, University of Saskatchewan
Nicole Haugrud, Department of Psychology, University of Saskatchewan

Purpose and Procedure: We are inviting you to participate in a study which involves completing tasks that of attention, memory, and language which have been developed to be culturally fair and appropriate for individuals living in rural and remote regions of Saskatchewan. You will also be asked to answer a few questions about your health and lifestyle. Any questions you may have about the study will be answered by the researcher whenever possible. Should you agree to participate, we will ask for approximately forty minutes of your time and will include a rest period if needed.

Potential Risks: Although there are no serious health risks involved in taking part in this study, you might find some of the tasks challenging. You will be provided a short break if you wish and you can stop any tasks that you do not want to complete. In preparation for this study, the researchers have consulted broadly with Aboriginal health researchers, health professionals and administrators working with Aboriginal peoples, and elders experienced in providing consultation to university students and researchers. Based on our previous experience using these instruments with older Aboriginal adults, we do not anticipate that you will experience any harm or discomfort as a result of participating in this study.

Potential Benefits: Your participation in this study may help us improve our understanding of how attentional and memory functions are organized in individuals of different cultural backgrounds and how they change as we age. In addition, our findings may help us to develop new methods to identify people who have memory and attention difficulties.

Although there may not be any direct benefits to you as a result of participating in this study, the information that you provide will help to guide our work in developing a culturally and geographically appropriate approach to the assessment of older adults. Because illnesses that result in cognitive impairment and dementia have a significant impact on the individual, the family members and other caregivers, and on the broader community, it is important that we develop assessment procedures that will enable health workers to accurately identify these problems and to begin to understand and describe helpful ways of caring for individuals with these illnesses.

Storage of Data: That data collected during this study will be securely stored in a locked office at the Aging Research and Memory Clinic for a period of at least five years following the completion of the study. Margaret Crossley, Director of the Aging Research and Memory Clinic, will assume full responsibility for the secure storage of this material.

Confidentiality: All information you provide will be kept completely confidential. Your name will not be associated with your information. Instead, you will be assigned a participant number, which will be used to identify your information, but will not appear on any forms with your name on them. This consent form and all other forms on which your name appears will be stored in a separate location.

The information collected in this study will form the basis of a dissertation and may be summarized in journal articles and/or professional conference presentations. At all times, only group data will be reported; individual participants will not be identified.

Right to Withdraw: Participation in this study is voluntary, and your decision to participate will not impact on any clinical services that would otherwise be available to you (e.g. assessment, treatments, relevant entitlements, etc.). You may withdraw from the study for any reason, at any time, without penalty of any sort. If you withdraw from the study at any time, any data that you have contributed will be deleted from our records.

Questions: If you have any questions concerning the study, please feel free to ask at any point; you are also free to contact the researchers at the address or numbers provided above if you have questions at a later time. This study was approved on ethical grounds for a 5-year period by the University of Saskatchewan Advisory Committee on Ethics in Behavioral Science Research on (insert date). Any questions regarding your rights as a participant may be addressed to that committee through the Office of Research Services (306-966-4053). Out of town participants may call collect.

Consent to Participate: *I have read and understood the description provided above. I have been provided with an opportunity to ask questions and my questions have been answered satisfactorily. I consent to participate in the study described above, understanding that I may withdraw this consent at any time. A copy of this consent form has been given to me for my records.*

(Signature of Participant)

(Date)

(Signature of Researcher)

Appendix M: Behavioural Ethics Review Board Approval for Study 4